LEP - Structure and Application

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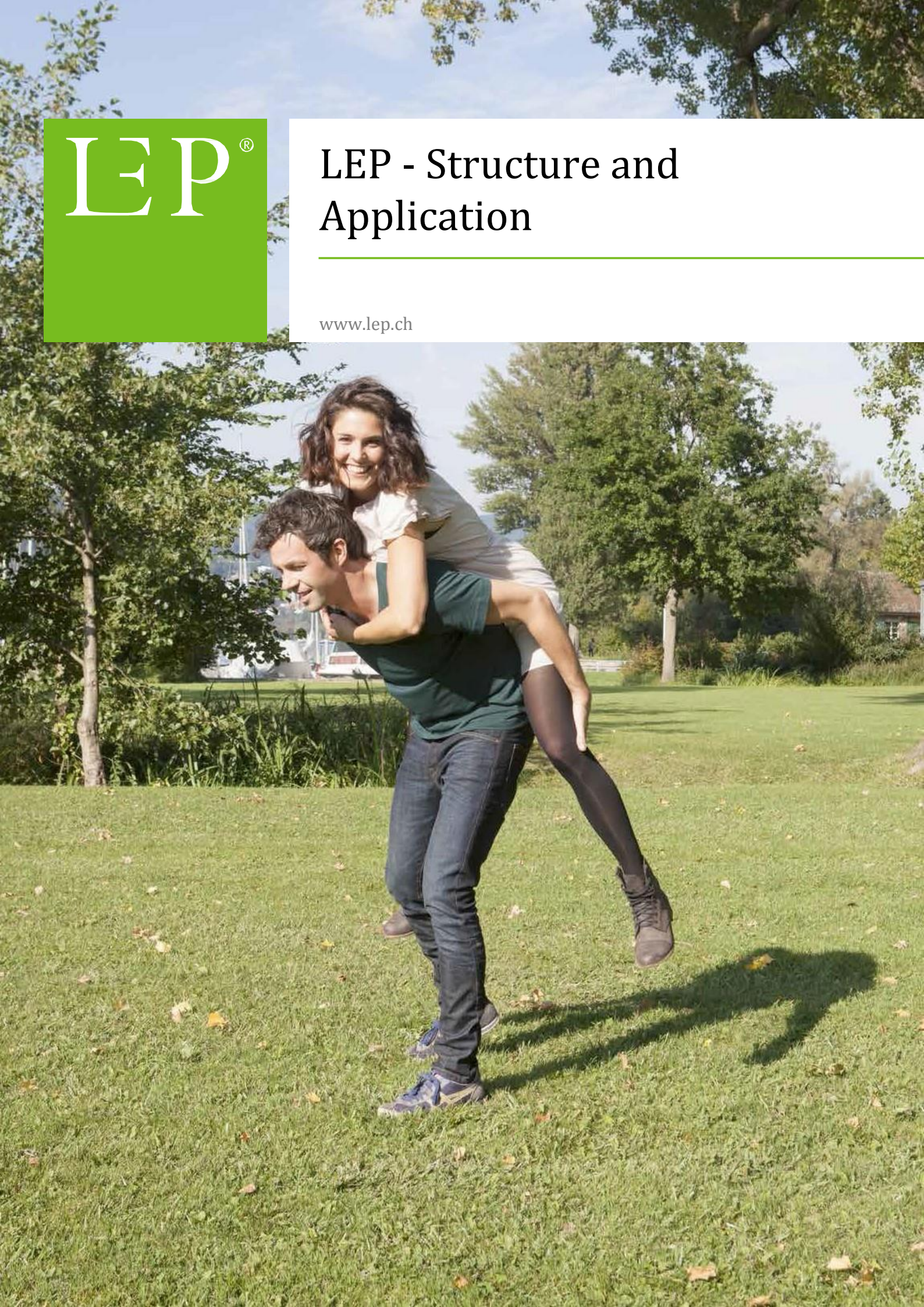

LEP – Structure and Application

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Contents

List of figures

List of tables

List of abbreviations

Abbreviation	Term
apenio®	Assessment based Planning and Evaluation of Nursing Interventions and Outcome Process-oriented nursing intervention planning (classification of nursing interventions)
FOPH	Federal Office of Public Health (Switzerland)
FSO	Federal Statistical Office (Switzerland)
CDA	Clinical Document Architecture The CDA is an XML-based standard developed by HL7 for the exchange and storage of clinical content
CHF	The ISO currency code for Swiss francs
CHOP	Swiss Operation Classification A classification of procedures (procedural codes). Also: Treatments and operations
CM	Case Mix
CMI	Case Mix Index
CMO	Case Mix Office of SwissDRG AG Consulting office of SwissDRG AG
DBfK	German Nurses' Association (*Deutscher Berufsverband für Pflegeberufe*)
DiZiMa®	Diagnosis-Targets-Actions (*Diagnose-Ziele-Massnahmen*) (classification of nursing interventions)
DRG	Diagnosis-Related Groups.
ENP®	European Nursing care Pathways (classification of nursing interventions)
ePA-AC®	Results-Oriented Patient Care Assessment (*Ergebnisorientiertes Pflegeassessment*) – Acute Care
G-DRG	German Diagnosis-Related Groups (Germany)
H+	Swiss Hospitals National association of public and private hospitals, clinics and special-care institutions
CH	Coefficient of homogeneity
HL7	Health Level 7 A set of international standards for the exchange of data between computer systems in the healthcare sector. The 7 in the name refers to Level 7 of the ISO/OSI reference model for communication (ISO 7498-1).
ICD-10-GM	International statistical classification of diseases and related health problems,-10th revision,-German modification. (Part of WHO-FIC)
ICHI	International Classification of Health Interventions (part of WHO-FIC)
ICF	International Classification of Functioning, Disability and Health (part of WHO-FIC)
ICN	International Council of Nurses
ICNP®	International Classification for Nursing Practice (part of WHO-FIC)

IHTSDO	International Health Terminology Standards Development Organisation (organisation that administers and develops the SNOMED-CT terminology)
ISCO	International Standard Classification of Occupations
ISO	International Organization for Standardization
KLV	Patient Care Services Regulation (*Krankenpflege-Leistungsverordnung*) (Switzerland)
KVG	Health Insurance Act (*Krankenversicherungsgesetz*) (Switzerland)
LEP®	Recording of Nursing Care Services (*Leistungserfassung in der Pflege*) (Used in nursing since 1988 for separate recording of nursing-care services and times. Used in other professions since 2001. Since 2006, also used for direct patient documentation. LEP is still used as a brand name now)
LiDia©	Littenheid Nursing Diagnostics
LOINC®	Logical Observation Identifiers Names and Codes (coding of laboratory measurements and of clinical and technical medical examinations)
NANDA-I®	Before 2002: North American Nursing Diagnosis Association Since 2002: NANDA International, Incorporation
NMDS	Nursing Minimum Data Set
PAMS	Nursing Workload Measurement System (*Pflegeaufwand Mess-System*) St. Gallen Cantonal Hospital, Switzerland (Predecessor to the first generation of LEP)
PCAP Suisse	Patient Care Analytics Platform, Switzerland (DRG-based LEP analytics module)
PCCL	Patient Clinical Complexity Level
PDP	Personnel deployment planning
PKMS	Complex Care Measures Score (*Pflegekomplexmassnahmen-Score*) (Germany)
NSU	Nursing Service Unit, e.g. LEP or PRN minutes
POP®	Practice-Oriented Nursing Diagnostics (*Praxisorientierte Pflegediagnostik*) (classification of nursing interventions)
PRN®	Projet de Recherche en Nursing (Nursing Research Project) (tool for the recording of nursing care services)
PPR	Nursing Staff Regulation (*Pflege-Personalregelung*) (regulation on standards and guidelines for staffing needs in inpatient nursing care)
R	Programming language and program system (R includes a large library of functions for statistical analysis and graphical representation. Statisticians around the world are continually adding to this library. Many of them use the language to develop and distribute new methods.)
®	Registered trademark for goods or services. (When a registered trademark is mentioned, it is followed by the ® symbol in running text the first time it appears)
REKOLE®	Review of Cost Accounting and Service Recording *Revision Kostenrechnung und Leistungserfassung* (Switzerland)
RIG-LEP	Regional Interest Groups of LEP Representatives (parts of the SIG-LEP, see below)
SBK	Swiss Association of Registered Nurses (*Schweizer Berufsverband der Pflegefachfrauen und Pflegefachmänner*)
SEAB	Subjective evaluation of workload

SEP	Nursing Workload Recording System (*System zur Erfassung des Pflegeaufwandes*), University Hospital of Zurich, Switzerland (Predecessor to the first generation of LEP)
SIG-LEP	Swiss Interest Group of LEP Representatives (cf. RIG-LEP)
SNOMED CT®	Systematized Nomenclature of Medicine – Clinical Terms
SwissDRG	Swiss-Diagnosis-Related Groups (Switzerland)
WHO	World Health Organisation
WHO-FIC	WHO Family of International Classifications

Note: The glossary can be found at the end of this handbook, on page 150.

Overview

The purpose of this document is to provide interested individuals in the healthcare sector, healthcare professionals and organisations, and software manufacturers with information about LEP's structure, content and potential applications so that they can make appropriate decisions about selecting the right LEP products and putting them into practical use.

LEP is based on the idea that electronic medical records and the associated clinical information are of central importance for patient documentation, and for the analysis and exchange of service data in the healthcare sector. In addition to quality of treatment and benefit to patients, LEP can also be used for service- and case-related compensation, since LEP provides a transparent and manipulation-resistant system based on patient documentation.

LEP's structure is based on a flexible building-block design, giving individual healthcare organisations a large degree of freedom in how they use LEP. When this design is used wisely, the conditions for patient documentation, the recording of services, and service-related statistics and analytics can be adapted in a targeted way to the possibilities and requirements of individual healthcare organisations. This provides each healthcare organisation with a targeted and manageable application, with a level of documentation and data-collection effort that is appropriate for the statistics it wishes to gather. If necessary, the ways in which LEP is applied can be extended or reduced at any time to ensure efficient, innovative and eHealth-compatible operations. The ability to develop many different variants is an important feature of LEP, and contributes significantly to its successful and wide-ranging application in over 250 healthcare organisations and to LEP's high degree of acceptance. The application is used in establishments of all sizes, from small facilities with 20 beds to hospitals with 2000 beds. LEP has been accepted in healthcare practice for about 25 years, it is verifiable and auditable, and as a learning system, it is subject to ongoing development.

Thanks to the LEP classification structure, LEP can be used with service data of varying scope and levels of detail. For example, it is possible to use LEP only in patient documentation, and (in terms of scope) only using services with case assignment, with a level of detail like "Providing gait training". Alternatively, LEP might be applied only for the recording of services and times, but with a scope that includes services both with *and* without case assignment, and a level of detail based at a higher aggregation level such as "Movement" or "Training".

With an eye toward core processes, when using LEP it is worthwhile using the least effort possible to gather data that are needed to fulfil mandatory requirements or obtain the desired statistics. If such data cannot be extracted automatically from patient documentation, methods based on weighting or allocation keys might be a smarter solution than separate recording of services and times. Therefore, one of the core principles for LEP applications in terms of data management is "Collect once, use many times". This means that in daily treatment practice, only data that are important for patient benefit and the quality of treatment are documented, and that these data can then be used many

times and in refined ways with the help of modern software technology. However, if it later becomes necessary to record data that are not relevant to documentation within the treatment process, LEP can be used to separately record such data simply and smartly at higher aggregation levels, without the patient documentation becoming “too full”.

LEP products are generally made up of analyses and classifications of the services provided by different healthcare professions, and their mappings and links with other classification systems and instruments. International developments and experience have a positive influence on the use and ongoing development of LEP. LEP is compatible with international standards designed to ensure a uniform data structure and uniform semantics (terminology) for the exchange of relevant healthcare data in a consistent way between organisations and across international borders.

Independent LEP expert groups, LEP’s scientific advisory board, and the LEP version management system, together with workshops, user conferences, scientific conferences and a systematic feedback system for users in healthcare practice, ensure LEP’s ongoing development and keep it up to date. Consulting and training efforts focus on the question of which tasks should be handled through the use of LEP, and on the practical application of LEP in statistical analyses, patient documentation, and the recording of services and times in healthcare organisations.

Structure of this handbook

This LEP handbook focuses on the structure and application of LEP in the context of statistical analyses based on service data, patient documentation and the recording of services.

Chapter 1 introduces LEP by presenting the idea, the application objectives and key features of the application. The structure of LEP is laid out in Chapters 2 and 3 with reference to the LEP classifications and the other classifications, instruments and standards that complement it. Chapter 4 describes the LEP analytics modules. Our description of the key aspects of a targeted application of LEP begins in Chapter 5. The next three chapters explain the application, with an emphasis on the complex relationships between analyses of patient documentation and the recording of services and times. Relevant aspects of data quality are then discussed in Chapter 9. Chapter 10 presents the LEP products, and Chapter 11 looks at issues of maintenance and ongoing development. Chapter 12 concludes the handbook with an introduction to LEP consulting and training services.

Exclusions

This LEP handbook does *not* cover the following two topics in detail: The individual analytics modules of LEP Analytics (see section 4.3, p. 46) and the software requirements for the implementation of LEP (see section 5.12, p. 72). Both of these topics are treated at length in separate documents.

1 Introduction to LEP

This handbook is intended for anyone who works in an eHealth setting with the application and use of healthcare data in electronic patient documentation, service recording, or statistical analyses with LEP.

When development first began in 1988, the abbreviation LEP stood for the German name *Leistungserfassung in der Pflege*, or "Recording of Nursing Care Services". An increasing number of additional healthcare professions were added to LEP starting in 2001, and direct patient documentation has also been available since 2006 with LEP Generation 3. Nowadays, LEP is still used as a brand name, and is used for more than "just" the recording and analysis of services. LEP is used in ways that adapt to a healthcare organisation's requirements. LEP is not software. The practical application of LEP's content and methods is supported by the software systems of each organisation that uses it.

1.1 The idea behind LEP

LEP has a modular "building-block" structure that allows for open-ended design and application. The reason for this approach is that an open design allows for versatile and eHealth-compatible applications of LEP. This is useful for service processes that are focused on benefits to patients. In accordance with this building-block design, individual LEP components can be combined into larger components or systems according to each healthcare organisation's objectives, ultimately leading to cost and time savings. LEP's building-block design means that it can adapt to an extremely broad range of requirements (those that apply within a healthcare organisation, and those that healthcare organisations impose on other organisations), since LEP components can be used in the health, support and management information systems needed for networking in an eHealth setting.

LEP's open-ended range of applications are ideally suited for use in the dynamic eHealth environment. Both the general public and professional service providers and service remuneration providers in the healthcare sector are increasingly interested in the benefits of eHealth, i.e. the integrated use of information and communication technologies for the design, support and networking of all processes and participants in the healthcare sector. Efficiency and quality, patient safety and economic strengthening are internationally considered as the overarching goals of eHealth (FOPH, 2007, 2; 12-13; EU, 2012, p. 3; Fitterer, Mettler & Rohner, 2009, p. 7–15; WHO, 2005, p. 109).

LEP is based on the idea that in order to successfully achieve objectives in an open eHealth environment, electronic patient documentation and the associated clinical information will, whenever possible and to an increasing extent, be of central importance for the documentation, collection, analysis and exchange of service data in the healthcare sector. With electronic patient documentation as the cornerstone, "bedside" health professionals can prepare their entries in such a way that, from their point of view, the quality and precision of the data are preserved for the patient's benefit. Electronic patient documentation makes day-to-day treatment safer and more efficient (NHCI & eHGI, 2013,

pp. 2–3). The clinical information recorded in this documentation is relevant to the health of people in need of healthcare interventions. This requires structured and interconnected data in the form of clinical terminology, e.g. for assessments, diagnoses, interventions or outcomes. With LEP, such data can be generated to support treatment and nursing processes and/or core processes (Wirnitzer, 2009) within the overall healthcare supply chain, and the documentation of those processes.

All healthcare service providers are part of a healthcare supply chain. Members of the healthcare supply chain include the hospital or clinic, "home healthcare", or service offerings in both the inpatient and outpatient sectors and in palliative care. LEP covers the entire treatment chain, and the interconnection and coordination of healthcare organisations and healthcare professionals. In this context, the aim of LEP is to be able to use LEP to document and analyse the services provided by all healthcare professionals involved in the treatment process.

LEP's broad-based palette of products and services in the fields of patient documentation[1] and the recording and analysis of services is designed to relieve professional service providers in the eHealth environment from the burden of redundant data collection for different application purposes and user groups. The goal is to provide service providers and service remuneration providers with useful service information at various levels of abstraction (cf. Fig. 2, p. 5 and Fig. 5, p. 11; NHCI & eHGI, 2013; Schulz, 2011). For reasons of efficiency, the data collected at the *point of care* – where healthcare services are required and provided – should be used multiple times, by various groups and for various purposes, e.g. for ensuring patient safety and demonstrating quality or for calculating revenue and human resources management. In other words: Documented once and used many times, intelligently-prepared data from the core process can also be used transparently and verifiably at the same time for management and support processes[2] (Weimann & Weimann, 2012; Wirnitzer, 2009), e.g. for reviews of effectiveness or efficiency (cf. Fig. 5, p. 11). To ensure the quality of the data, it is important to take the perspective of the professional "bedside" service providers into account here. The basis for a user-oriented approach to data processing is the use of structured clinical data from electronic patient documentation – that is, data that healthcare professionals providing services in practice do not have to collect solely for the purposes of an "insatiable bureaucracy" (Schulz, 2011, p. 27). This approach allows healthcare professionals (doctors, nursing staff) to return to concentrating on their actual bedside services (Stark & Hölzer, 2005, pp. 1944–1945).

The effort expended on recording administrative data, as well as case-related documentation efforts, must be kept within manageable limits with regard to their scope and complexity (Stark & Hölzer,

[1] Considered as the patient-centred portion of a clinical information system (CIS), patient documentation plays an increasingly important role in the coordination of services within and between healthcare organisations, whereas the previously predominant administrative portion of a CIS is pushed back to background processes and, with its functions that are far-removed from the actual treatment process, takes its place in the larger overall process of service delivery and billing (cf. Fig. 25, p. 77).

[2] ...DELETE THIS FOOTNOTE (not needed in English)...

2005, p. 1946). To this end, service data can be automatically derived from electronic patient documentation. A separation between clinical patient documentation and administrative tasks, e.g. the recording of services for human resources management, should be avoided whenever possible for efficiency reasons. For example, a business controlling process focused on costs and revenue for a given cost centre requires service data that are not highly detailed, but perhaps complete. On the other hand, with regard to a person's overall health status[3] and the healthcare interventions required in connection with that status, healthcare professionals working at the patient's bedside require detailed service data, but only a specific case-related part of those data.

To ensure efficient use and contextualisation, i.e. the best possible adaptation to local properties of a given organisation[4], LEP seeks to provide structured service data with the ability to be as precise and/or as abstract as necessary (eHealth Suisse, 2014, p. 4). Depending on each organisation's application objectives, LEP can be used to record data ranging from partial to complete and from granular to non-granular (cf. Fig. 1, p. 3; Fig. 2, p. 5 and Fig. 5, p. 11).

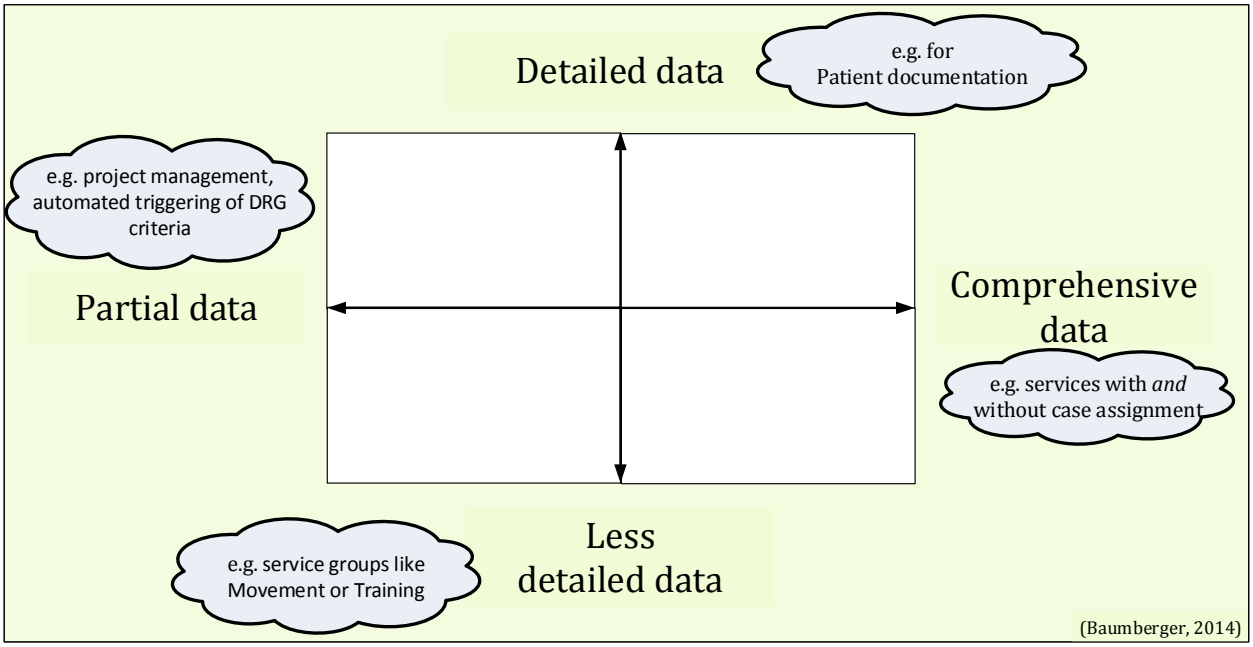


Fig. 1: Properties of data with LEP

In the various fields within the healthcare sector, these data may be used in simple ways or repeatedly in multifaceted ways. Detailed LEP services are important for patient documentation, and may trigger revenue-related DRG grouping criteria or be linked with assessments, diagnosis, targets and outcomes for a transparent record of performance (Baumberger, 2014b).

An open eHealth environment that is focused on individuals in need of healthcare interventions also requires the ability to exchange data across organisations and borders within the healthcare supply chain, along with effective reuse of clinical data. To ensure the interoperability of LEP data that is

[3] (NLM, 2016b).

[4] Conditions, (contextual) factors, incidents, requirements, prerequisites.

needed in such an environment, LEP orients both its data structures and its terminology toward international trends and politically-recognised rules, such as the family of internationally recognised healthcare classifications (eHealth Suisse, 2013; eHealth Suisse, 2014; ICN, 2013; WHO-FIC Family Development Committee, 2012). In order to analyse personnel management data and compare results at an international level with regard to healthcare services, LEP relies on the international classification of occupations (ISCO-08) for the coding of occupational groups. This allows for international comparisons based on uniform definitions of occupational groups in the healthcare sector and a hierarchical structure (FSO, 2014b; Dal Poz, Gupta & Quain, 2009, pp. 14–21; ISCO, 2012).

The idea behind the interoperability of LEP data, then, is that LEP data can be used both locally and internationally in order to ensure patient safety, sustainability of use, and financial savings.

1.2 Where LEP is used

LEP is used under licence in about *250 healthcare organisations* in Germany, Austria, Italy and Switzerland (LEP AG, 2016). Over half of them are hospitals, but others include psychiatric clinics, rehabilitation clinics and nursing homes (cf. Table 1).

Excerpt from LEP reference list for Germany	
Frankfurt am Main	Johann Wolfgang Goethe University Hospital
Ganderkesee	Stenum Ortho GmbH
Göttingen	University Hospital of Göttingen
Görlitz	Görlitz Municipal Hospital
Halle	University Hospital of Halle
Hamburg	Bethesda General Hospital Bergedorf
Hamburg	University Hospital of Hamburg Eppendorf
Hannover	Hannover Medical School
Kiel	University Hospital of Schleswig Holstein
Coblenz	Military Hospital

Table 1: Example excerpt from LEP reference list for Germany (LEP AG, 2016)

The number of LEP reference organisations is growing continuously every year. A wide variety of reports relating to its deployment, feasibility, and application in healthcare organisations have been presented at conferences and published in the literature (e.g. Balmer, 2011; Dorner, 2012; Imhoff-Hasse, 2010; Kaenel, 2008; Mai, Henneberger, Löffler & Flerchinger, 2014; Marfurt, 2009, p. 12; Steuer & Rosery, 2006; Weber, Bamert, Steuer & Spani, 2003; Willems, 2009). LEP is used in various specialisations within healthcare organisations, and its effectiveness has been evaluated in a number of projects, e.g. in intensive care (Horbach & Behrens, 2003; Horbach & Behrens, 2004; Müller et al., 2006), palliative care (Holzinger, 2008), psychiatry (Krüger, 2002), elder care (Kaiser, 2004) and

outpatient care (Dudek, Radtke-Limberg & Kroge, 2004). LEP can also be applied in other areas, including operating rooms, emergency rooms, recovery rooms, birth centres, outpatient clinics, rehabilitation and home healthcare services (Brügger, Bamert, Maeder & Odermatt, 2002b, p. 32).

1.3 Essential components for the use of LEP

The most essential components for the use of LEP are the LEP classification of services provided by health care professionals, and the LEP secondary classifications (see section 2, p. 16). Depending on the application objectives, the "LEP Classifications" component is combined with other LEP components. Other ("outside") classifications, instruments and standards constitute an important component for the application. LEP analytics are also a fundamental component of how LEP is used (Fig. 2).

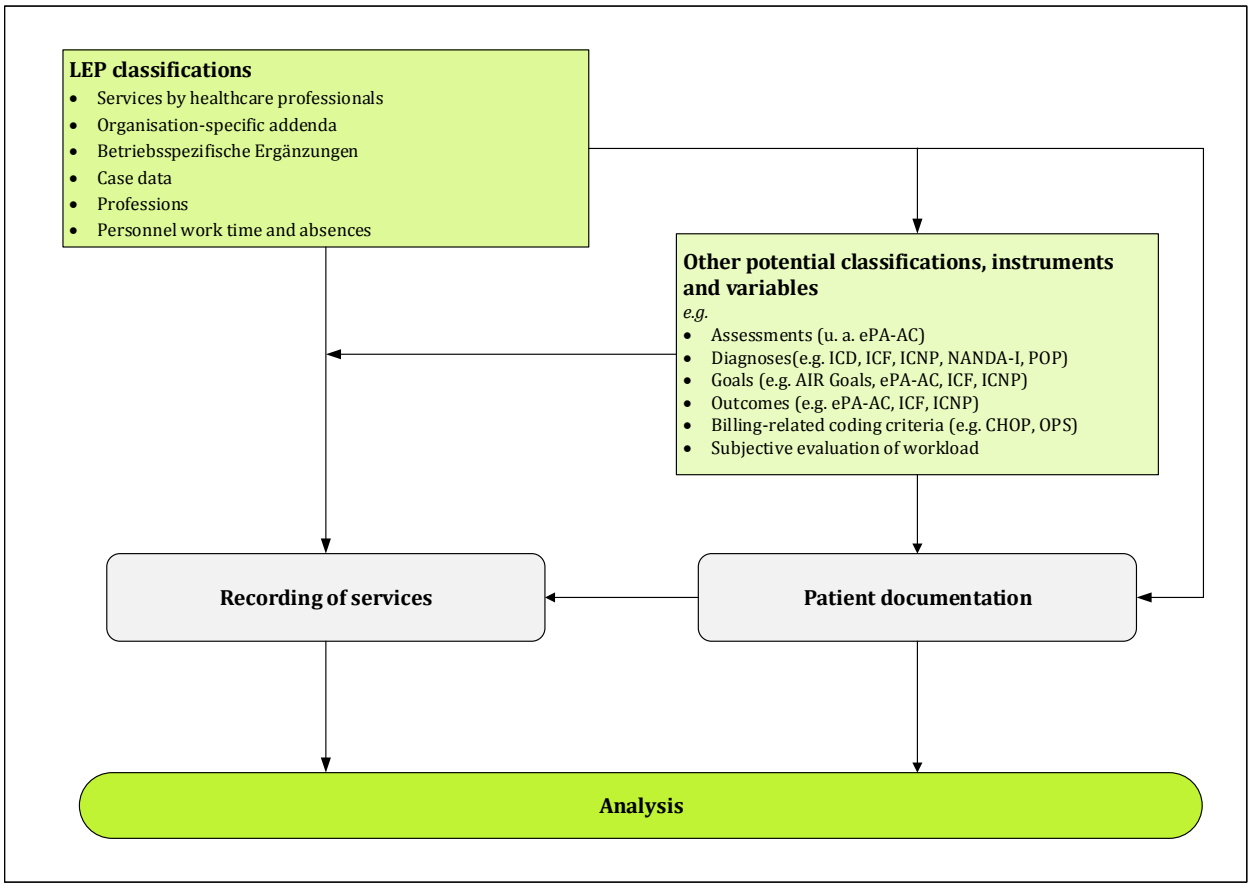


Fig. 2: Essential components for the use of LEP

The components are used to set up the use of LEP in patient documentation, in the recording of services and times, and in statistical analyses relating directly to other classifications and instruments such as assessments, diagnoses, outcomes, service frequencies or time spent on services, staff time and costs.

The LEP classifications name and structure the actions taken by health care professionals, and other situations that are relevant for the analysis of service data, in a monohierarchical structure in accordance with the structural principle of the classification (cf. Fig. 2, Fig. 5, p. 11). The classification of services is related in a systematic way to the other components for the use of LEP. The relation from

the classification of services to the “Other Classifications, Instruments and Standards” component is constructed by means of links and mappings, to the following in particular:

- other classifications and instruments such as assessments, diagnoses, targets, outcomes, cost-related coding criteria, subjective evaluations of workload;
- individual reference variables such as time spent, staff times, quality indicators, revenue/costs, cost centres, length of stay.

The relation to analyses (cf. Fig. 2, p. 5), including data comparisons, is established through sets of rules that specify what should be calculated from the other LEP components, and how.

In order to use LEP, it must be determined which components will be used in which ways (cf. Fig. 2, p. 5). Methodologically, two starting points must be distinguished: How the LEP components are used in electronic patient documentation and in the recording of services and times, and how the data then feed into the analyses that the healthcare organisation wants to perform (cf. Fig. 3).

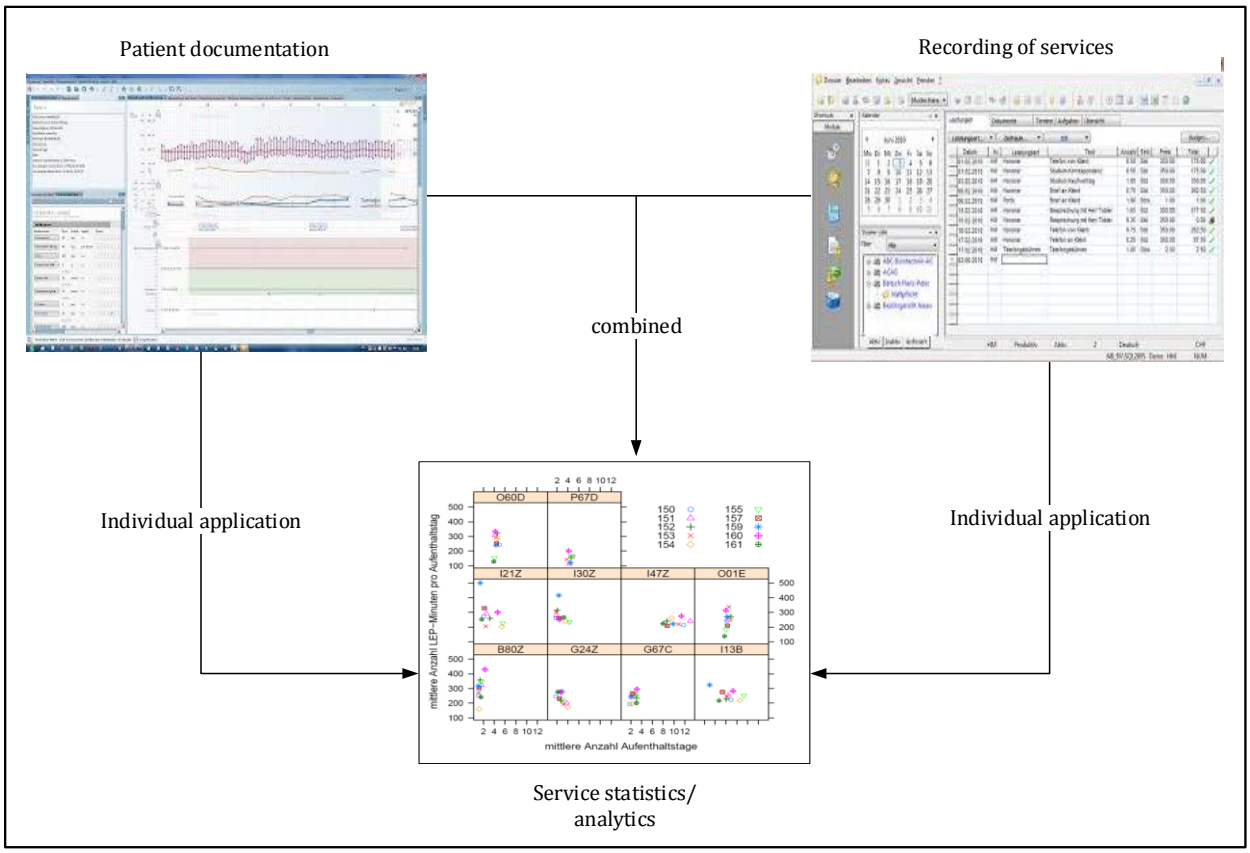


Fig. 3: Patient documentation, recording of services, and service statistics with LEP

When using LEP, patient documentation and recording of services can be put into practice as follows (cf. Fig. 3 above):

- combined[5]

[5] i.e. complementing one another

- simultaneously as individual applications, but separate from one another
- only one of the two as an individual application

Starting from these basic applications, more sophisticated LEP applications that are adapted to the individual organisational setting can then be methodically built up, ultimately resulting in the analyses that the organisation wants to perform. Depending on the documentation and recording methods chosen in practice, certain LEP analyses are possible. Conversely, user groups' requirements for the resulting analyses can be used to determine the appropriate LEP documentation and recording methods (compare Fig. 3, p. 6, with Fig. 5, p. 11), e.g. automated recording of services and times based on the LEP interventions from electronic patient documentation. Another possibility is to record all services independently of patient documentation at the abstract level of LEP service groups.

Finally, it should be clear that LEP is *not* software; rather, it provides software applications with structure and technical content relating to the services of healthcare professionals, independently of any specific software, which can be used as needed to meet the objectives of a given healthcare organisation.

1.4 LEP application objectives

LEP was intentionally developed as a multi-purpose classification for use in different fields in different practical applications with different volumes of data and different levels of detail for a variety of different user groups. This flexibility means that LEP can be adapted to reflect the intended use of case and service data, as well as organisation-specific contextual factors. It ensures efficient control over precision and abstraction, as well as long-term benefits. LEP provides the basis for a systematic, data-driven and learning-based approach to planning, providing, monitoring and controlling the healthcare services provided to individuals and groups of people, with the goal of improving cost-efficiency, quality and health (Pfaff, 2010). The objectives of LEP applications can be summarised as follows:

- LEP provides the different healthcare sectors with a common terminology for documenting healthcare interventions, and in parallel, a system for measuring the time spent on services as well.
- LEP delivers a wide range of analysis options to improve the effectiveness and efficiency of healthcare services.
- LEP ensures the traceability and verifiability of the services provided.
- To avoid duplicate recording of data, LEP combines healthcare interventions in patient documentation with service workload measurement.

- LEP supports communication about healthcare interventions and services between the various actors involved, including healthcare professionals, management staff, researchers, cost bearers, politicians and the public, especially people with an immediate need for healthcare interventions.
- LEP provides data that can serve as a basis for the study and understanding of healthcare interventions and related situations, including patients' health status (assessment, diagnosis, result/outcome), process flow, staff composition, pre- and post-calculations, costs and prices.
- LEP provides data that can serve as a basis for decisions about healthcare interventions and other services in the healthcare sector, as well as other related situations.
- LEP makes it possible to document and analyse healthcare interventions at an organisation-specific level of detail or aggregation, and to compare them at the national or international level between healthcare organisations, healthcare services or different fields in the health care sector.
- LEP supports compliance with statutory conditions and provisions.
- LEP provides a systematic approach to encoding healthcare interventions and other services in the healthcare sector for software applications and healthcare information systems.
- LEP delivers the requirements for the development and use of helpful and manageable software systems for LEP in the fields of treatment and nursing care, quality assurance, and evaluation of results, as well as revenue assurance and healthcare policy.

1.5 The many applications of LEP

The requirements for a modern patient documentation system and for the recording of operational data are often very different. Existing structures and organisational processes must be respected, and the methodologically suitable LEP system must be integrated into the existing CIS environment.

LEP offers a wide variety of methodologically different solutions for application in practice, in conjunction with healthcare interventions and services without case assignment that are provided by healthcare professionals. It is important to note that the application of LEP can be adapted to individual healthcare organisations. How LEP is methodologically integrated into the processes and structures of each organisation's operating procedures, and which LEP data are recorded and analysed, is primarily determined by the various needs that are present, by internal or external guidelines, and by the issues faced by the affected user groups at each healthcare organisation. For example, LEP offers effective solutions for the following issues:

- Is it important for the user groups to document, analyse and communicate about all or some of the services provided by healthcare professionals?
- Is it important to the user groups to be able to record data easily, and will they accept data analysis that may be less informative in order to achieve this? Or is a highly informative data analysis important to the user groups, and will they accept a data recording process that may be more demanding in order to achieve this?

- Is it important to the user groups to be able to precisely measure the type and number of healthcare interventions and the times when they were provided?
- Is it important to the user groups to be able to measure both planned healthcare interventions and those that are actually provided, and to compare them with each other ("target vs. actual" comparison)?
- Is it important to the user groups to record the time spent carrying out healthcare interventions completely and in detail?
- Is it important to the user groups to have a clinical justification for the provision of healthcare interventions and evidence of their effectiveness?
- Do user groups want to limit legal liability by systematically documenting specific healthcare interventions in patient documentation?
- Is it important to user groups to use detailed data on healthcare interventions to automatically trigger billing-related codes from patient documentation?

Based on whether and how the various user groups answer "Yes" or "No" to the questions above, an application of LEP can be developed that is adapted to those answers, or to the requirements that can be derived from them, and to the circumstances of the individual healthcare organisation (cf. Fig. 4). LEP can be methodologically adapted for application in practice, depending on the purposes for which it is used. How LEP is used will vary with those purposes; for example, it might be used with DRGs to provide cost components or revenue-related grouping criteria.

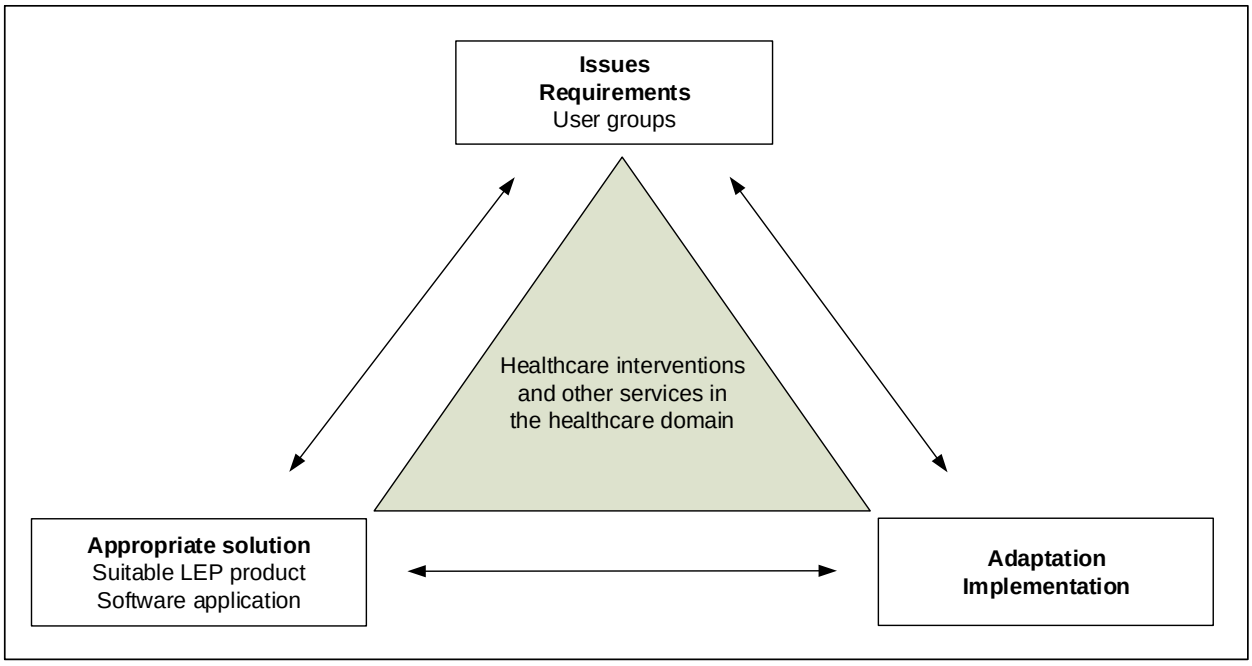


Fig. 4: Adapting the use of LEP to user and organisational requirements

LEP supports user groups with methodologically distinct and optimised solutions for various questions and the requirements derived from them.

1.6 User-oriented solutions with LEP

LEP's methodological diversity and flexibility of application is surely one of its most obvious strengths. But these very advantages can also be a weakness in practical application if LEP is introduced without clarifying the operational requirements and without a targeted selection of products. Depending on the chosen objectives, an LEP application based on the "less is more" principle can easily be more efficient than a solution with an enormous but unnecessary range of potential uses (cf. Fig. 4 oben). How completely the core, management and support processes are represented, the level of detail in service data, and the level of effort spent on documentation and recording are all closely linked to one another. It is important to ensure that the LEP application strikes an appropriate balance between the costs and benefits of these aspects, and that a modern software application is deployed (Besson, 2013, p. 259).

It's important for each healthcare organisation to define its goals clearly. What information is needed? What's the right information to collect? What should be done on the basis of this information? For example, LEP allows for complete and detailed recording of the actions of healthcare professionals in practice, e.g. in the nursing or midwife occupational group (cf. Fig. 5 unterhalb). Meanwhile, detailed clinical data provide service providers and service remuneration providers with a high degree of transparency about the services provided, thanks to direct documentation e.g. concerning the correct coding of revenue-related DRG criteria or for quality verification. Any irregularities in the service data can be reviewed and identified, e.g. by the controlling department or the health insurer, based on detailed LEP data (IBES, 2014, p. 24).

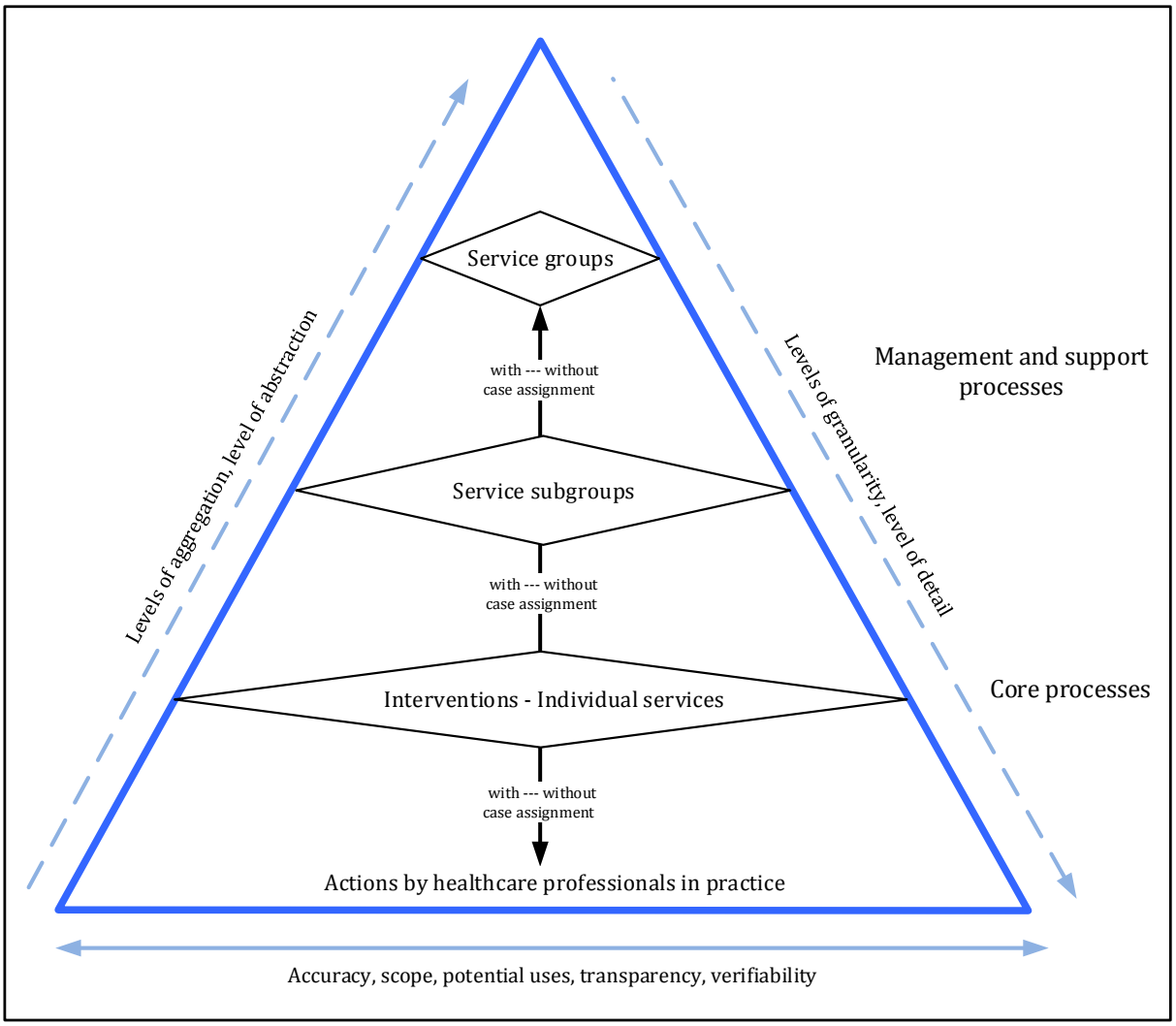


Fig. 5: Options for using the LEP classification

Let us consider another example involving the calculation method for cost unit accounting according to REKOLE (Besson, 2013). For cost unit accounting according to REKOLE (full costing method), the costs of a cost centre's service providers are divided by the total number of LEP minutes spent on healthcare interventions or case-related services (see example from the "Nursing" occupational group in Table 2).

Nursing cost rate per LEP minute	=	Cost centre costs for nursing / Σ of LEP units
Nursing costs for case	=	Nursing cost rate * Σ of the case-specific LEP units

Table 2: Service-related nursing cost rate for calculation of case costs with LEP

This results in a service cost rate per LEP minute.[6] Non-case-related LEP services provided by healthcare professionals therefore do not need to be recorded separately for cost unit accounting purposes, because they have been included in the calculations for the cost rate in accordance with

[6] Average costs per service unit.

the REKOLE method (InEK, 2007, pp. 132–137). Let's look at a concrete example: The total nursing costs for the service-providing "Neurology" cost centre are CHF 117,258,395 for a given year. Dividing this total by 81,660,353 LEP minutes results in a nursing cost rate of CHF 1.44 (Baumberger, Jucker, Hertzog & Oggier, 2013). The effective nursing costs for a case with 5,000 LEP workload minutes would then be CHF 7,200. In addition, calculation based on fully-automated recording of services from patient documentation is already used in current practice (Oertle & Baumgartner, 2010). In this case, one-time collection of the data at the point of care is sufficient in practice, i.e. with no additional recording effort, which is often perceived by professional service providers in the healthcare sector as a burdensome administrative task (Schulz, 2011, p. 27).

For potential optimisation of management or work processes, however, healthcare interventions from patient documentation may not provide sufficient information, and could in this case be complemented with additional indicators, i.e. with services without case assignment that are provided by healthcare professionals, e.g. for training or project tasks (cf. Fig. 5, p. 11, and Fig. 2, p. 5). Besides the completeness of the data, questions as to the level of detail and the collection period must also be taken into account in order to effectively manage the work processes.

Depending on the intended use, LEP can focus methodically on all service data in detail, or only on individual and less-detailed service data (cf. Fig. 1, p. 3). From a methodological point of view, the volume of data that is generated (used) should ideally be fully exploited, and provide 100% coverage of user requirements.

Taking full advantage of all of LEP's possible uses is an option, but not a requirement, when selecting a (partial) application of LEP that is focused on efficient use and organisational understanding. One final factor to consider in selecting the appropriate application of LEP is the operational context, i.e. the connections between the user groups' requirements, the objectives, structures and operational processes, and the ability of the software application to get the best possible results out of the selected LEP application (see section 12, p. 141). The LEP utilisation rate can often be optimised with regard to the volume of data and level of detail (cf. Fig. 1, p. 3, and Fig. 5, p. 11).

Time savings are an important objective for professional service providers in the areas of patient documentation and data recording. But short-term savings from simplifications based on aggregation or incomplete data alone are not really a solution. What do "easy" and "fast" mean? From what perspective? Which data, and how much data, are needed or required in this context by the various actors in the healthcare sector? Is the level of recording effort justified? Is too much or too little data being recorded? Answers to these questions are found by carefully analysing the individual requirements on site. Given the many constraints on the properties of the data, decision makers on site are faced with the question of which application of LEP makes sense for them and their employees in light of the prerequisites and performance issues associated with the software to be used. Ultimately, every organisation will have to answer this question for itself. What looks like the best option from

the perspective of business controlling or economic coding may face resistance from the healthcare professionals working at patients' bedsides – that is, from the people who will have to actually record the data. Whether and to what degree healthcare organisations will want to invest in seemingly simple, but additional and isolated service recording systems, remains to be seen. The expected time savings from automated data recording from patient documentation will be the way of the future.

In summary, then, the choice of how to apply LEP should be made carefully in order to maximise its effectiveness. The ideal LEP solution will be the one that is found to be the most feasible and readily usable at the time of the decision, in light of the affected user groups and the properties of the healthcare organisation in question. It is important to ensure that even methodologically simple LEP solutions are implemented in a flexible way so that, in case the requirements change later, LEP can continue to be adapted and expanded in a way that maximises its benefits. Ideally, documentation time can be kept low even as requirements change for data quality and completeness in patient documentation.

1.7 Strengths and benefits of LEP

Facilities and organisations in the healthcare sector are faced with the challenge of working efficiently and ensuring effective production. They must strike a delicate balance between high quality of treatment, low use of resources, and the desire to improve service recipients' state of health. To help them manage this challenge, LEP delivers service data that make it possible to measure the effectiveness and efficiency of their healthcare professionals, and/or the productivity of core, management and support processes within the healthcare supply chain (BaRos, 2011, pp. 26–27).

1.7.1 Networked

- LEP focuses on the core process in the healthcare sector – treatment and care for patients – while also delivering robust data to serve as a basis for relevant management and support processes.
- As the point of contact between patient documentation and the analysis of services, LEP establishes clear and comprehensible communication between core, management and support processes.
- Not having to record data twice means that professional service providers don't have to put any additional effort into recordkeeping. Clinical staff are less overloaded with "bureaucracy", and have more time to spend working with patients.
- Data already present in other software applications are carried over and processed in LEP – such as labour costs, data on nursing and treatment consumables, or data on absences or overtime from a personnel deployment planning (PDP) system – or passed from LEP to other software applications.

- LEP is a dynamically deployable multiple classification that can be adapted for use with different framework conditions in the healthcare sector, e.g. different billing systems or statutory provisions.
- The LEP classification structure allows documentation to be entered at varying levels of detail, or additional data to be recorded.
- LEP allows for active knowledge management in patient documentation by means of direct references to guidelines or quality standards.
- LEP combines a case-oriented service perspective with aspects of a staff-oriented work time recording system.
- LEP is linked with other classification systems in the healthcare sector, or can be linked with them later.
- LEP can be extended with other applications and tools for relevant data that are directly related to services (e.g. the subjective evaluation of workload).
- Through an unambiguous recoding process, LEP enables compatibility with international standards and allows for the transfer and comparability of service data; in terms of semantic interoperability, for example, LEP is compatible with the SNOMED CT and ICNP reference terminologies.
- Service data already detailed with LEP in patient documentation can be stored or complemented with more detailed clinical data, or with the data preferred by the individual organisation.
- LEP is designed for multilingual use, and is available in English, French, Italian and German.

1.7.2 Adaptable

- LEP is open to a range of methodological applications, and can thus be adapted to the requirements of different organisations or user groups.
- LEP allows for flexible integration into operational processes, e.g. it can be integrated into electronic patient documentation, a graph, wound care protocols, clinical pathways or service blocks.
- Depending on user requirements, LEP offers documentation and service recording at different levels of aggregation with corresponding analyses.
- Both treatment-related case and service data and other important management indicators are processed in a targeted and logically comprehensible way for core, management and support processes, e.g. services and costs for training and quality management or for individual occupational groups, including differentiation by function and level of training (skill and grade mix).
- LEP can be used as a simple work time recording and work time analysis instrument with a simple relation to service groups, including default settings for the specified work time for alignment with non-detailed service groups.
- LEP provides detailed, justifiable and directly reviewable service data for the calculation of a service-oriented cost rate as part of cost unit accounting methods relating to individual cost centres and cost units.

- With LEP, revenue-related classification criteria can be exported automatically, e.g. DRG criteria like ICD, OPS or CHOP codes.
- LEP ensures the automatic export of treatment-related and specific healthcare interventions from patient documentation for various questions and/or analyses.

1.7.3 Multifaceted

- LEP offers a multifaceted range of analysis, prognosis and benchmarking options, e.g. with detailed, coarse-grained, selective or complete case and service data.
- LEP works with multiple perspectives and delivers different types of information in the form of statistics and reports that can be used by professional healthcare service providers, management staff at all levels, and politicians for a vast range of purposes.
- LEP is sustainable, providing organisations and cost bearers in the healthcare sector with health-related data that support the ongoing review and improvement of treatment quality, cost-effectiveness and appropriateness of treatment.
- LEP provides a record of service thanks to fast, concrete documentation based on health-related case and service data.
- LEP is effective: a direct link is established from the service to the treatment or care need, e.g. to assessments, diagnoses, treatment goals and outcomes.
- LEP has a direct benefit, providing information on patient needs and on individual treatment and care in patient documentation.
- With LEP, the required (target) services and the services that are actually provided (actual) can be identified and compared in a variety of different ways.
- Target and actual costs, e.g. staff or materials costs, can also be systematically compared.
- LEP provides support, delivering service data to support efficient day-to-day work operations in healthcare organisations.
- LEP can be used to measure healthcare professionals' productivity, e.g. by comparing the proportions of services with and without case assignment.
- LEP provides cost data on services in the core process and on services in the management and support processes.
- LEP allows for the differentiated assessment of a balanced mix of qualifications (skill/grade mix) or of support ratios, e.g. with regard to the nurse-patient ratio.
- LEP offers comprehensive service statistics: The type of service, the time when it was provided, and the expected time or the time actually needed to carry it out are all analysed.

2 The LEP classifications

2.1 Basic principle of a classification

A classification is a subdivision of different entities according to a certain principle. An example of such a principle would be a classification which organises entities into classes at different hierarchical levels. These classes, which are also referred to as groups, categories or chapters, are further subdivided. Each class has a class title that serves as a heading to label the content of that class. Besides this textual description of the concept[7], each class typically has an (alpha)numeric code as well (key, notation). An entity is assigned to a given class by "coding" it with the code for that class.

One might assume that each classification can be derived from a more-or-less naturally-occurring selection of content items and structures. This is not the case, however. The purpose to which the classification will be put is what determines its structure and the selection of content within it. This is by no means a minor distinction, and indeed it is central for our understanding of classifications, since this selection determines what information will ultimately be retained in a given classification. As such, the selection is based not only on the observed data, i.e. the "object" itself, but also on the purpose of the classification; the context in which the issues are addressed, or the "subject", are therefore relevant as well. Depending on which issues we want to address, the perspective changes as well – and with it, the selection of information that is relevant to that perspective (Straub, 2009, pp. 63–68). For an expert understanding of classifications, including the LEP classification of services, it is therefore important to always keep in mind that the contents, the subdivision of classes, and their level of detail are determined by the intended application of the classification itself.

In addition, classifications should be understood as necessary complements to terminologies[8], e.g. for the term "Administering a liquid", to support the coding of data for analysis purposes (cf. Fig. 8, p. 21). Terminologies and classifications should be seen as complementing one another (WHO, 2007a, p. 7). To describe actions and to enable communication between healthcare professionals and (e.g.) service remuneration providers, a terminology is needed. To subdivide (structure) the terminology for actions, a classification is needed (Appenzeller, 2002).

LEP consists primarily of the classification of services provided by healthcare professionals. Four additional secondary classifications are also available. Codes from these secondary classifications are usually necessary for a comprehensive analysis of the classified services. The codes bring meaning to the analyses of these services. For each analysis, there are specific codes and, depending on the questions to be asked, specific calculation rules.

[7] Descriptor

[8] Technical terms, concepts, or language; technical vocabulary.

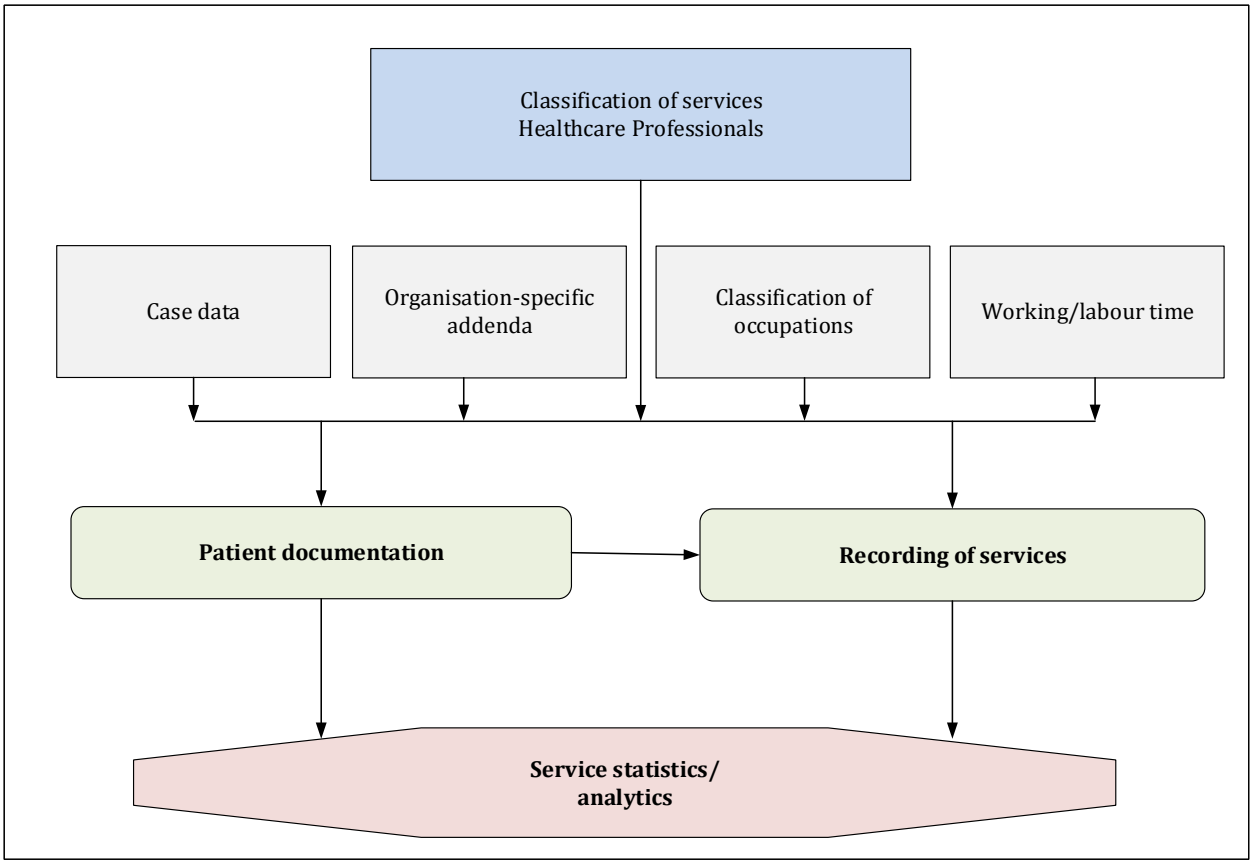


Fig. 6: Main classification and secondary classifications in LEP

2.2 Classification of services provided by healthcare professionals

This LEP classification subdivides the set of technical terms for actions performed by healthcare professionals into classes according to certain criteria (cf. Fig. 8, p. 21). It is intended to serve as a useful and manageable classification for stakeholders in the healthcare sector, in which service data oriented to the goals of the healthcare organisation can be coded at the appropriate hierarchical levels of the classification and recorded, retrieved and evaluated (Gaus, 2005; ISO, 2007, p. 6; Oemig, 2011; WHO, 2007b; Zaiss et al., 2005). Depending on a healthcare organisation's objectives, more or less detailed data, either partial or complete, must be available. The structure of the LEP classification provides the basis for the selection and processing of appropriate data. It is the foundation for any application of LEP (see section 1.2, p. 4).

2.2.1 Conceptual framework

An LEP service is understood from a behaviour-oriented perspective as the execution of an action[9] that is carried out in a particular time frame (cf. Fig. 7 unterhalb). In addition, it is assumed that healthcare professionals act in a certain way and with a particular result in mind.

[9] e.g., within the treatment chain, the execution of physical or psychosocial actions.

Primary LEP services are those provided to, with or for individuals, e.g. the services provided by a midwife, physiotherapist, registered nurse or doctor to a patient in order to reduce their pain (services *with case assignment*, see section 2.2.4, p. 22). Primary services arise from the existence of a person who requires services due to their state of health, with these services being provided for purposes of prevention, treatment, rehabilitation and care. As the service recipient[10], the person may be present during the service event, and may be active or passive during the event[11], or may not be present (*direct* and *indirect* interventions, see section 2.2.4.2, p. 23). The focus on a single service recipient can be extended to multiple patients, or to relatives and other affected individuals, e.g. for services like "Providing behavioural training" (in groups) or "Dispensing advice" (to relatives providing care).

The complete service spectrum of a healthcare professional or healthcare organisation becomes evident when we also include the *secondary* services that are carried out in support of the primary services or the treatment process, e.g. educating students, quality assurance, team meetings or equipment maintenance (services *without case assignment*, see section 2.2.4 p. 22).

From a results-oriented perspective, in contrast to the behaviour-oriented perspective, (LEP) services not only manifest themselves in a certain type of action that is taken with a certain result in mind; they also manifest themselves *in the result* of the action itself (cf. Fig. 7).

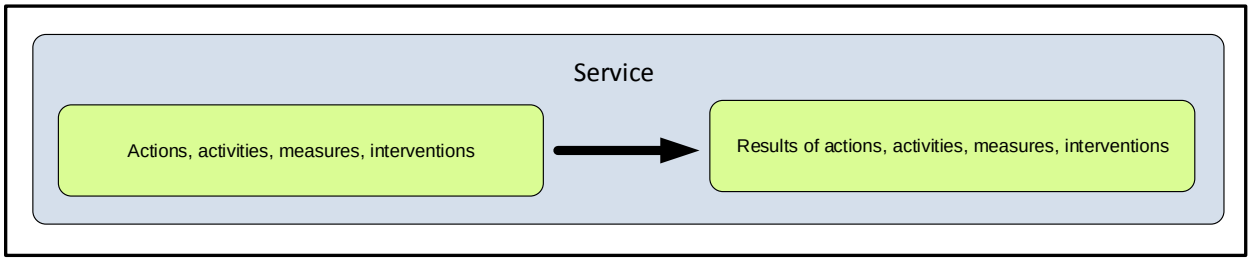


Fig. 7: Clarifying the concept of a "service"

From this perspective, a service performed by healthcare professionals is the result of actions that can be evaluated e.g. with respect to the improvement and maintenance of a state of health, or with respect to the relief of suffering.

Considered from both perspectives, a service can be understood as both an action (process) and as an outcome (cf. Fig. 7, oben). Services as processes and as outcomes should be accorded equal weight whenever possible. Both material and immaterial circumstances should be taken into consideration, as well as the complex contexts in which the services are provided by healthcare professionals. There is no single answer as to whether services should be considered as processes or outcomes; the interpretation depends on the structures in which the services are provided. These structures are defined

[10] Patient, client, resident, case, customer.

[11] Active for acquisition of knowledge in educational situations, or passive for positioning of unconscious patients.

by patient characteristics, assessments and diagnoses; the characteristics of the healthcare professionals and of the interaction between the patient and healthcare professionals; and characteristics of the patient care setting at the given health care organisation. Simplifying somewhat, the conceptual framework of LEP services can be grounded in Donabedian's (1966) three traditional dimensions of quality: structure, process and outcome. (BaRos, 2011, pp. 6–7; Lee & Mills, 2000, pp. 67–69; Pfaff, 2010, 26, 29)

Initially, LEP services can be evaluated with a focus on the structures and the process, e.g. by assessing the reasons for a service, the number of services provided, the amount of time (in hours) needed to provide the service, the necessary resources, or who provided the service and when and where they provided it. Alongside these descriptive and quantitative statements (e.g. frequency distributions, variability), which tend to be oriented toward questions of efficiency, a focus should also be placed on the outcome, i.e. on the benefit or value of the services (e.g. probabilities and statistical models of a service's effects on and benefits to patients). In this regard, efforts have been under way for some time to shift the criteria by which services are evaluated from the workload side to the outcome side, so that it possible to measure whether healthcare professionals are "doing the *right* things right" (Gray, Shepperd, Ison, Lees & Pearce-Smith, 2009, p. 45). The focus should be on measuring the quality of outcomes for the patient (Bürki, Kuster & Baumberger, 2010, p. 24).

The services provided by healthcare professionals cannot be evaluated exclusively from one perspective or the other if we hope to achieve a consensus-driven basis for the approach we choose to take, and e.g. if we want to achieve an acceptable cost/benefit ratio for services (Gutzwiller et al., 2012, p 2). The benefit and value of services from healthcare professionals depends on the perspective of the stakeholder making the assessment. For example, patients, service providers, service remuneration providers, government authorities and industry representatives all bring different criteria to their evaluations of the services that are offered or provided (Gutzwiller et al., 2012, p. 6; Krempkow, 2005, pp. 17–18). At least three different perspectives can be taken into consideration when evaluating services: the patient's perspective (optimal treatment), the medical perspective (medically appropriate services), and the financial perspective (cost/benefit ratio, avoiding negative impacts for third parties, avoiding rationing) (Gutzwiller et al., 2012, pp. 1–2).

To illustrate the idea that different perspectives can give rise to different assessments, consider how we might evaluate the performance of a heavyweight boxer vs. that of a figure skater. Intuitively, it's clear that each of these disciplines will apply its own understanding of performance and success in comparing and evaluating a given athlete's performance. Each discipline has its own rules and measurement techniques, and applies different requirements and criteria to its evaluation of performance in terms of physical power, endurance, concentration, dexterity and elegance (Schedler, 2005, p. 11). Similar considerations apply to evaluating the services provided by healthcare professionals. Here,

too, each professional group (e.g. doctors or nurses) applies its own rules and measurement techniques, and can evaluate performance from a variety of different perspectives, e.g. based on physical function or on the interaction between health care professionals and patients. And here again, the person making the assessment and their understanding of performance will determine whether a given performance was "good" or "bad". The people making these assessments may be healthcare professionals at the point of care, management staff, quality management officers, training managers, scientists, controllers or service remuneration providers. Finally, it's important to note that there are no strict or absolute performance indicators in the healthcare sector. Therefore, the perspectives of multiple stakeholders must be taken into consideration when evaluating the services provided by healthcare professionals. Evaluating their performance without taking multiple perspectives into account is generally considered to be unhelpful, as it increases the risk of misinterpretation (Krempkow, 2005, pp. 17–18).

Depending on the perspective taken, a wide variety of different indicators can be assigned to LEP services for evaluation purposes, e.g. outcomes, quality indicators, staff times or revenues. In LEP products and analyses, a certain number and combination of indicators are associated with various services *by default* so that the service data can be evaluated from as many different perspectives as possible. Given the context laid out in the preceding paragraphs, however, it is essential to keep in mind that the default LEP indicators are not intended to represent absolute performance indicators for interpretation, and that they do not cover every perspective.

2.2.2 Classification structure

The LEP categories for the services provided by healthcare professionals are arranged according to hierarchical criteria based on levels in a monohierarchical structure. Moving upward through the hierarchy, the four hierarchical levels are referred to as increasing *levels of aggregation*. Each level serves as an aggregation of the level below it, e.g. multiple interventions are merged into a single service subgroup, or multiple service subgroups are merged into a single service group. Moving downward through the hierarchy, the four levels are referred to as increasing *levels of detail* (see Fig. 8 unterhalb).

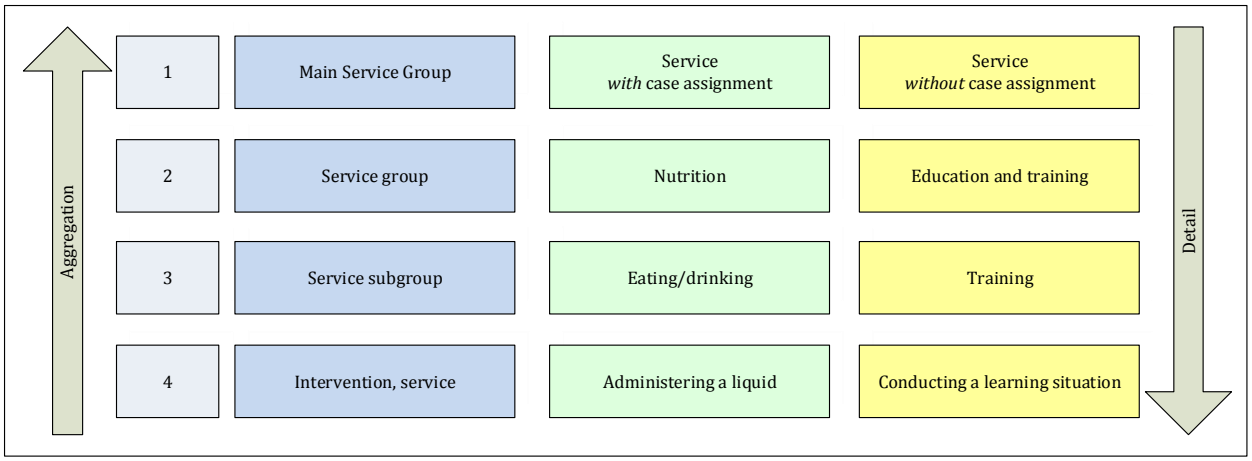


Fig. 8: Organisation of the LEP service classification

Level 1 represents the highest level of aggregation, while level 4 represents the highest level of detail.[12] Moving downward, levels 1 through 4 are categories of actions, defined as follows:

- Main service group (one-place codes: 1),
- Service group (two-place codes: 1.1),
- Service subgroup (three-place codes: 1.1.1) and
- Healthcare intervention or individual service (four-place codes: 1.1.1.1).

(cf. Fig. 8, section 2.2.4, p. 22 and section 2.2.4.2, p. 23). Accordingly, the structure of LEP service classification system as a whole is based on a four-place numerical code.

Intervention codes (see section 2.2.4.2, p. 23) are assigned to services *with* case assignment, e.g. "Administering a liquid". The other service codes on the 4th level are referred to as individual services, and are assigned to services *without* case assignment, e.g. "Conducting a learning situation" (cf. Fig. 8).

2.2.3 Assigning information units

LEP services are assigned to information units[13] like definitions, inclusions and exclusions, recording rules, time values or billing headings at different levels of aggregation (see section2.2.4, p. 22_ Additional information units like organisation-specific addenda, case data, occupational groups or work times are provided in the LEP *secondary classifications* (see section 2.3, p. 31). These information units can be systematically recorded using the secondary classifications or copied over from other information systems and then assigned to the LEP services.

Therefore, LEP service data essentially consist of the services themselves, together with the recorded and assigned information units. The recorded service data can then be used for LEP analytics and data comparisons, or transferred to other systems (cf. Fig. 25, p. 71).

[12] Use of the lower levels helps to make the content more comprehensible.
[13] Attributes, properties.

2.2.4 Definition of service types

Based on shared and distinct properties at each aggregation level, four service types are distinguished (cf. Table 3).

Main Service Group	Services with case assignment This main service group records interventions that are assigned to a patient or an administrative case and that have a definable value for time spent. The individual interventions are performed in accordance with various therapeutic approaches (concepts, methods, standards, guidelines). They are planned and carried out in connection with health statuses (assessments, diagnoses, objectives, outcomes).
Service group	Chaperoning/support This service group records interventions relating to patient chaperoning, transportation and support.
Service subgroup	Risk reduction This service subgroup records interventions relating to endangerment of the self and others.
Intervention	Dispensing advice Execute a communication process in a structured and targeted manner to promote competence.

Table 3: Examples of service-type definitions

2.2.4.1 Services with and without case assignment

The main service group is subdivided on the "service type" criterion (cf. Fig. 8, p. 21, and Fig. 9 unterhalb; Baker, 1998; Besson, 2013, p. 207, 223; Dussault, 2011, p. 11; Huber, 2003, p. 17; ICN, 2002; InEK, 2007, pp. 132–137; Morris, MacNeela, Scott, Treacy & Hyde, 2007, p. 468; Sovie & Smith, 1986; Thibault, 1990, p. 28).

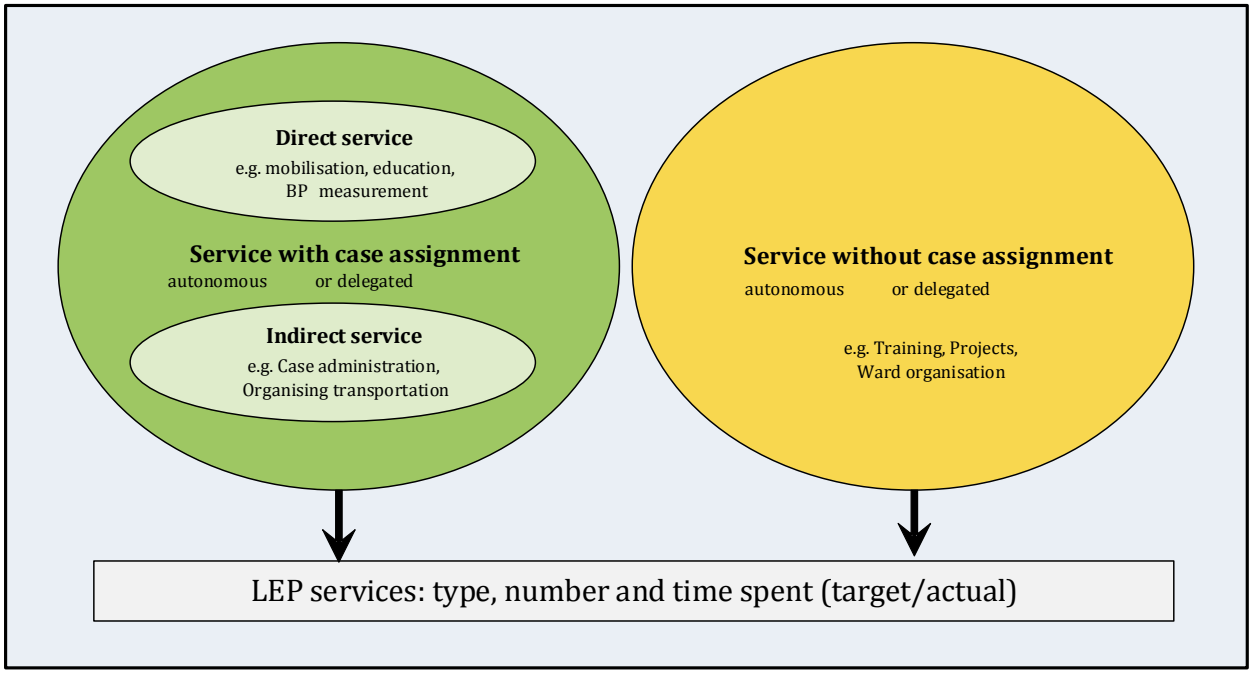


Fig. 9: Services with and without case assignment

Services with case assignment are carried out "with", "on" or "for" a person, and can be assigned to an administrative case. These services are executed in accordance with various therapeutic approaches (concepts, methods, standards, guidelines). They are planned and provided in connection with different health statuses (assessments, diagnoses, objectives, outcomes). For cost accounting purposes, they are needed to record the services that apply directly to a cost unit (administrative case).

Services without case assignment are services not assigned to an administrative case that are performed to support, ensure and develop treatment and operational processes. They can be transferred to an individual case or specifically separated out, using applicable costing and operational guidelines. They do not need to be recorded separately for cost unit accounting purposes; instead, they are included in the calculations through the use of a cost rate, or reassigned to the cost unit (administrative case) (cf. Table 2, p. 11).

2.2.4.2 Direct and indirect interventions

Following the ICHI[14], an LEP healthcare intervention is an action that is taken on behalf of a person or the general populace in order to evaluate health, functions or states of health, and to modify or improve them (WHO-FIC Family Development Committee, 2012, p. 6).

Healthcare interventions include those services *with* case assignment on the 4th level of aggregation that are performed "with", "on" or "for" people in need of healthcare interventions as part of the treatment and nursing process (cf. Fig. 8, p. 21). Based on their properties, they are subdivided into *direct* and *indirect* interventions (Dussault, 2011; Morris et al., 2007; Sovie & Smith, 1986):

Direct healthcare interventions are performed "with" or "on" a person in need of healthcare interventions as part of the treatment and nursing process, e.g. "Administering a liquid", "Performing mobility training", "Dispensing childbirth advice" or "Intravenously administering an injection".

Indirect healthcare interventions are performed "for" a person in need of healthcare interventions as part of the treatment and nursing process, e.g. "Maintaining patient documentation", "Organising patient appointment" or "Compiling documentation for service remuneration providers".

It is important not to confuse indirect interventions with the individual services without case assignment on the 4th level of aggregation (Fig. 9, p. 23).

[14] International Classification of Health Interventions.

2.2.4.3 Composition of a service

In general, an intervention or individual service consists of informing the service recipient, preparation, performance of the service, observation, the use of devices or auxiliary aids, follow-up and documentation. This is relevant for the documentation and recording of services, and is known as the *documentation* or *recording principle*. Complying with this principle avoids excessive detail in patient documentation and service recording, as well as over-recording of individual services.

For example, the procedure for the "Attending to a wound" service consists of

- reviewing patient documentation,
- informing the patient about the service to be provided, the state of the wound, etc.,
- preparing the wound dressing material,
- cleaning and dressing the wound,
- observing the condition of the wound,
- using the wound dressing material,
- disposing of wound dressing material, and
- entering information in the wound documentation.

In accordance with the principle, this entire procedure is included in the time values attributed to a given service (see section 2.2.6, p. 29).

2.2.4.4 Inclusions and exclusions

An LEP service is an independent action within the flow of actions in practice. Depending on the flow of actions, however, it may also be only a part of an action, e.g. "Performing nail care" may take place in a separate situation from other services, or as part of "Performing partial personal hygiene activities". To support the documentation and recording of services in practical situations like there, inclusions and/or exclusions are associated with interventions and individual services in certain cases.

Inclusions apply to connections between services for which one or more services can be part of another service. In the inclusion, situations and codes are named that may be part of the given intervention in a particular situation, e.g. "Performing partial personal hygiene activities" should be coded when "Washing the chest", "Washing the arms" and "Washing the back" are performed within a sequence of actions (cf. Table 4).

Term
Washing the arms
Washing the chest
Washing the buttocks
Washing the face/hands
Hair care
Washing the genital area
Preparing and following up on personal care products
Cleaning the mouth/teeth
Performing nail care
Washing the back

Table 4: Examples of inclusions for the service "Performing partial personal hygiene activities"

In LEP, *exclusions* apply to services that should not be coded with the code for this intervention, but with another explicitly specified code, e.g. "Performing a full body wash" should be coded instead of "Performing partial personal hygiene activities" if all parts of the body are cleared within a sequence of actions.

Term
Performing a bath
Showering
Performing a full body wash

Table 5: Examples of exclusions for the service "Performing partial personal hygiene activities"

2.2.4.5 Special service types

With regard to the LEP application, it is important to be aware of certain special service types within the classification.

2.2.4.5.1 Otherwise specified services

Each group includes a "leftover class" for otherwise specified services. "Otherwise specified" services, e.g. "Otherwise specified movement" or "Otherwise specified training", are used to record services that are not contained in the LEP classification at the time of recording. What is unique about these services is the purposes for which they are used. They are used to:

- Identify and temporarily bridge gaps in the content of the classification.
  Otherwise specified services allow for short-term documentation / recording of services that are missing from the LEP classification. The missing services are added to the next version, and ensure the validity and completeness (exhaustiveness) of the classification's content. Until the next version becomes available, the organisation using the application generally receives a suggestion from LEP AG on bridging the gap with an organisation-specific intervention (see section 2.3.1, p. 31, and Table 8, p. 32).
- Identify and eliminate problems with understanding and applying the classification.
  Due to deficiencies in areas like training, users' understanding of the classification or of its aggregation and detailing mechanisms, or the user-friendliness of the software, an existing LEP intervention may not be found. Evaluating the entities coded under "otherwise specified" services can help to identify such deficiencies and resolve them in a targeted manner.

The time value is "DF" (default value for "otherwise specified" services) and has a null value (cf. Table 7, p. 29).

2.2.4.5.2 Services that cannot be assigned to a case

If, in the practical application of LEP, a service with case assignment (i.e. a direct or indirect intervention) cannot be assigned to the appropriate case because no administrative case has been opened, e.g. in the CIS system, it is recorded under the main group "Services without case assignment" and under the service sub-group "Services with no case". For example, if a patient calls a registered nurse in the hospital on the phone and requires extensive advice about changing a wound dressing, and the registered nurse then cannot record this service as assigned to a case.

The time value is "D" (default value) and has a zero value (cf. Table 7, p. 29).

2.2.4.5.3 Professional and personal allowance times

When it comes to recording services and times, there is reason to question how reasonable and valid it really is to assume that 100% of healthcare staff's work time will be utilised for the provision of services. Portions of work time that are needed to cover organisational imperfections or to handle personal needs can be referred to as allowance times (KDA, 2005; Mølgaard, 2000, pp. 43–44). This time is not available to the healthcare organisation for the performance of services ("lost time"). It is important to take this time into account in connection with service activity, staff planning and productivity measurements. Allowance times include:

- professional allowance times, e.g. due to organisational or management-related imperfections, workflow disruptions, uncoordinated work flows, unclear work instructions or time spent waiting for information or patients;
- personal allowance times, e.g. for fulfilment of human needs, rest breaks, preventative back rest, lavatory time, refreshments, private conversations, eating, personal tasks, going to insurance

appointments or checking emails, going over the regularly scheduled break time, personal inconveniences, needs that cannot be put off (cf. Fig. 31, p. 81).

It may be useful to record allowance times. In LEP, they are included under services without case assignment. Professional allowance times can be recorded with various individual services under the service group for "Setting-/Structure-related efforts" and the service sub-group "Waiting time" or "Work interruption". Personal allowance times can be recorded under the service group for "Setting-/Structure-related efforts" and the service sub-group "Work interruption" with the individual service "Personal work interruption".

The time value is "D" (default value) and has a zero value (cf. Table 7, p. 29).

If an organisation wishes to investigate the reasons for relatively high allowance times and to make relevant changes to work processes if necessary, it may be useful to record them. It must be decided whether allowance times should be recorded continuously or for a limited period of time. An alternative option is to use allocation keys, e.g. 5% personal allowance time per employee (see section 6.3, p. 80).

2.2.5 Structure of the LEP terminology

The terminology for LEP interventions is structured in accordance with the ISO reference terminology model for nursing interventions, which serves as the international standard (see Fig. 10 unterhalb; ISO, 2014, pp. 9-13).

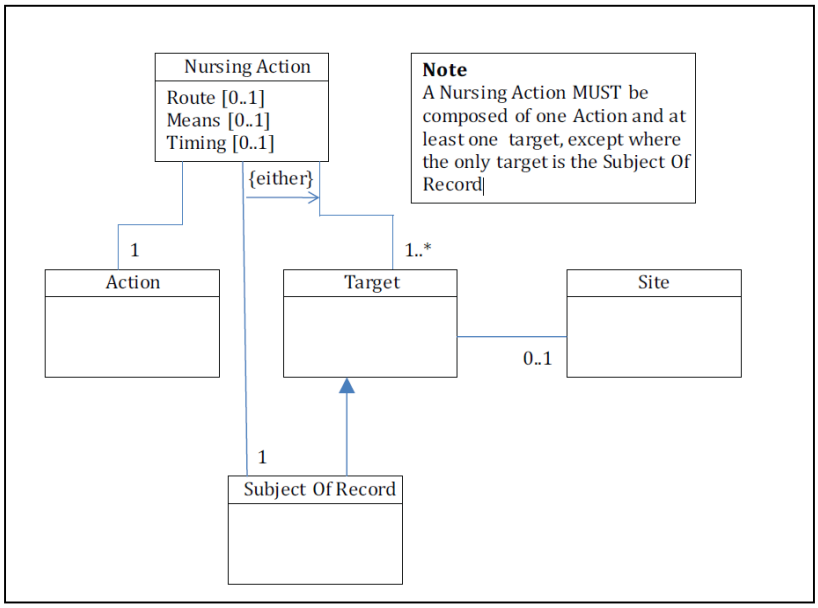


Fig. 10 The reference terminology model for nursing interventions (ISO, 2014, p. 10)

In accordance with ISO standard 18104:2014 (Baumberger, Stadler & Buchmann, 2012; ISO, 2014), the name of an LEP intervention consists of the following structural elements (cf. Fig. 10):

1. a word for the *action* (e.g. administering)
2. and at least one for the *target* of the action (e.g. liquid)

Combining the two examples above, we get the intervention name “Administering a liquid” (cf. Fig. 8, p. 21). Additionally, and optionally, words can be added from other semantic fields to construct the terminology for a given LEP intervention (cf. Fig. 10 oben and Table 6 unterhalb):

- *Route*
- *Means*
- *Timing*
- administrative case *(subject of record)*
- location on the body *(site)*

The structural elements of action, target and means are also used for the names of the interventions in the International Classification of Health Interventions (ICHI) that is currently being developed (WHO-FIC Family Development Committee, 2012). This will make it significantly easier to establish a structural mapping from LEP to ICHI in the future.

In accordance with ISO standards, LEP does not use inflected verbal forms (present, past) or imperative forms (commands); nor does it phrase intervention labels in the form of instructions for action.

LEP Name \ Axes	Action	Orientation	Access	Means	Location	Case
Moving joints through the whole range of motion	moving (through	joints				
Intravenously administering an injection	administering	injection	intravenously			
Measuring vital signs using a monitor	measuring	vital signs		monitor		
Locating a patient	locating					patient
Measuring the pH value of the umbilical cord	measuring	pH value			umbilical cord	

Table 6: Examples of terminology structures for LEP interventions

In the LEP classification, the individual terms used to label the interventions are *pre*-coordinated (cf. Table 6, “LEP name” column). LEP intervention names thus have a pre-coordinated structure. In the background, a multiaxial structure is used in which the individual terms (e.g. “monitor”) are inserted into individual structural elements (e.g. “Means”). Breaking the names of LEP interventions down into linguistic units creates the basis for structural interoperability (Bointner, 2008, p. 5).

It quickly becomes clear that these semantic axes can be used to add further detail and greater precision to any intervention. So it is evident from the basic structure of the LEP classification that the system has great potential for future developments as well. For example, interventions like “Providing gait training” or “Performing transfer” can be specified in greater detail by using the “Means” axis with terms for assistive devices for movement, e.g. canes, rollators or walking frames. To take another example, terms in medication lists are entered with LEP interventions like “Administering medication conjunctivally” or “Administering medication orally”.

The future will decide which additional elements should be linked to the LEP interventions, and how many additional elements should be linked to them in what ways. Additional elements may well be useful for a complete depiction of the activities of professional service providers in the healthcare domain. Even now, they are often represented in the information model or software application, or in electronic patient documentation, e.g. the distinction between planned interventions and interventions that are or are not carried out, and links from interventions to diagnoses or to revenue-related DRG classification criteria.

2.2.6 The typology of time values for LEP services

In the classification of services provided by healthcare professionals, all services at aggregation levels 1 to 4 (cf. Fig. 8, p. 21) are assigned time values in the form of default values (Table 7).

Abbreviation	Description	Value
D	Default value	Null value (NULL) or number of minutes, e.g. 5 minutes
DF	Default value for "otherwise specified" services	Null value (NULL)
DA	Default value for aggregated time recording	Null value (NULL)

Table 7: The typology of time values for LEP services

A default value in LEP is a standard time value which is proposed for the purpose of recording the time spent on particular services ("initial value", "standard value"), and which can be changed. In other words, the difference from a traditional normative time value or reference time value is that a default value can be changed. In general, two kinds of default values can be distinguished:

A A specific number of minutes is specified by default, i.e. when patient documentation is prepared or when services are recorded, a certain number of minutes is assigned to the given individual service or intervention.

Example: The "Performing lateral positioning" service takes 5 minutes in the actual case at hand. The associated default value in minutes is also 5 minutes. When preparing patient documentation or recording the service, the professional service provider automatically re-uses the value "5" for the number of minutes.

B A null value ("NULL") is specified by default, i.e. when patient documentation is prepared or when services are recorded, a certain number of minutes must be explicitly assigned to the given individual service or intervention.

Example: The "Conducting an assessment/anamnesis" service takes 30 minutes in the actual case

at hand. When preparing patient documentation or recording the service, the professional service provider enters the value “30” for the number of minutes.

The time value is not (yet) known, because the time spent on carrying out such services can vary widely, e.g. due to vascular dementia, highly variable pain levels or varying work flows.

Both types of LEP default values can be modified by the licensed healthcare organisation:

a The healthcare organisation can enter another minute value after consulting LEP (cf. point A above).

Example: LEP specifies a default value of 5 minutes for the “Performing lateral positioning” intervention. The organisation’s guidelines specify 10 minutes for this intervention. The organisation modifies the default value and sets it to 10 minutes.

b Instead of a null value, a healthcare organisation can specify a time value with a specific number of minutes after consulting with LEP (cf. point B above).

Example: LEP specifies a null value as the default value for the “Conducting an assessment/anamnesis” intervention. The organisation’s guidelines specify 30 minutes for this intervention. The organisation modifies the default null value and sets a time value of 30 minutes.

The healthcare organisation determines which default minute values, if any, may be copied over or modified during patient documentation or when recording services.

- Service providers may *not* change the default minute value (see A, a and b above) during patient documentation or when recording services.
- Service providers may change the default minute value (see A, a and b above) during patient documentation or recording of services, i.e. they can re-use the default time value or modify it to fit the situation.

  Example: The “Performing lateral positioning” service takes 10 minutes in the actual case at hand. The associated default value in minutes is 5 minutes. During patient documentation or when recording services, the professional service provider modifies the minute value to “10” minutes.

On aggregation levels 1 to 3 (main service group, service group, service subgroup; cf. Fig. 8, p. 21), the default values are defined as null values (NULL) (see B above). On level 4 (interventions, individual services), the default values are defined either as null values *or* as time values specified as a number of minutes (see A, a and b above).

For time values as a number of minutes (cf. Table 7, p. 29), the specified value is a reference value chosen so that, on average, a trained and experienced healthcare professional can provide the given service in the specified time while complying with quality standards. The difference between the minute values specified by default and the minute values actually recorded for individual services can be analysed for a variety of purposes, e.g. to modify the relevant default values in LEP or to identify opportunities for change in work processes.

2.2.6.1 Time values under two minutes

Individual interventions and services with time values under two minutes are only included in the LEP classification of services in exceptional cases, e.g. one minute for "Intravenously administering a bolus". However, if such interventions and services do need to be recorded in a healthcare organisation's patient documentation or its recording of services, they are incorporated into the LEP secondary classification "Organisation-specific addenda" (see 2.3.1, p. 31).

2.3 LEP secondary classifications

In addition to the services themselves, additional useful service and case data can be used for extensive and detailed LEP analyses. Additional instruments and classifications are used for such analyses.

An LEP secondary classification is an independent classification that can be used in parallel with the LEP service classification. Each LEP secondary classification has an internal structure identical to that of the LEP service classification. The LEP service classification has a certain number of outward-facing "docking stations", i.e. the necessary interface points.

The LEP secondary classifications include complementary information that is used for patient documentation and assessment of services, adapted to the specific purposes for which they are used. If the information is already present in other systems at the organisation, the relevant units in the LEP secondary classification can be replaced by equivalent elements in their application environment.

2.3.1 Organisation-specific addenda

With the LEP secondary classifications for organisation-specific addenda, an organisation can document, record, save and analyse the healthcare services and information it defines and formalises separately in accordance with its own specific needs. For example. the services "Closing door" and "Raising bed barrier rails" are relevant from a legal perspective, and should therefore be documented separately. These two services can then be assigned to the fourth level of aggregation, "organisation-specific intervention".

Number	Name	Aggregation level
3	Organisation-specific addenda	1
3.1	Group for organisation-specific addenda	2
3.1.1	Sub-group for organisation-specific addenda	3
3.1.1.1	Organisation-specific case information	4
3.1.1.2	Organisation-specific intervention	4

Table 8: LEP secondary classification for organisation-specific addenda

Another healthcare organisation wants to record services with time values under two minutes (see section 2.2.6.1, p. 31) and incorporates them at the appropriate levels. Meanwhile, a different organisation may want to specifically document behavioural instructions or suggested attitudes like "Active listening", "Proposing a conversation" or "Showing interest in the patient".

Only after consultation with LEP should organisation-specific services or information be used to compensate for services missing from the LEP classification (see section 2.2.4.5.1, p. 25).

In addition to organisation-specific interventions, "organisation-specific case information" can also be assigned to the fourth level of aggregation (cf. Table 7, p. 29), e.g. "hearing aid" or "glasses".

No time values are assigned to organisation-specific information (cf. Table 8 oben); instead, they are abbreviated with "IFS" (information, organisation-specific case information). Organisation-specific interventions use time type "DF" (default value, organisation-specific intervention) with a zero value (cf. Table 7, p. 29).

2.3.2 Case data

This LEP secondary classification is primarily used to record and analyse data

- about the patient and/or the administrative case (master data),
- about the context of service activity (type of stay, change in circumstances; state of health)

(Table 9).

Number	Term	Aggregation level
4	Case data	1
4.1	Master data	2
4.1.1	Person	3
4.1.1.1	Case number	4
4.1.2	Type of stay	3
4.1.2.1	Inpatient	4
4.1.3	Type of stay, expanded	3
4.1.3.1	External inpatient	4
4.1.4	Change in circumstances	3
4.1.4.1	Planned admission	4
4.2	Condition	2
4.2.1	Perception	3
4.2.1.1	Disorientation/confusion	4
4.2.2	Language	3
4.2.2.1	Foreign mother tongue	4

Table 9: Examples from the LEP secondary classification for "Case data"

The LEP secondary classification for "Case data" is hierarchically structured, and like the structure of the main LEP classification of services (see 2.2, p. 17), it includes four numerically encoded levels of

aggregation and is constructed without a time type. Case data are abbreviated with "I" (information about the case).

Healthcare organisations can record the context of an LEP service in further detail with additional process and structural data[15], based on organisation-specific information (see 2.3.1, p. 31). For example, this might include information about material circumstances such as building conditions, or immaterial circumstances such as guidelines, rules, standards and laws that are relevant to how services are provided. But it might also include information about the patient's physical condition, such as physical sensitivity or allergies, or the social context, like the interaction between patient and healthcare professional and the organisation/management of the healthcare practice (Pfaff, 2010).

2.3.3 Classification of occupations

On the one hand, this secondary LEP classification provides a way to precisely describe and analyse service activity in the healthcare sector in connection with occupational and professional-training structures for personnel management. On the other hand, it is helpful for making decisions about support and management processes. To do this, the services are linked with the occupations of the service providers, e.g. the service "Conducting a discussion on crisis intervention" is documented by a certified registered nurse, and the service profiles of the different occupations are compared with one another for the analysis of services.

The "LEP classification of occupations" primarily covers occupations in the healthcare system. Members of these occupations, e.g. midwives, registered nurses or speech therapists, provide healthcare services to the population (FSO, 2012; BMG, 2015; KLDB, 2011). To allow for ongoing development, the LEP classification is open in principle to other occupational fields, e.g. administrative professions, quality assurance officers in the healthcare sector, or wellness professions. The classification is hierarchically structured and comprises four numerically coded classification levels (cf. Table 10).

[15] Contextual structure, i.e. the material and immaterial circumstances that pertain when the services are provided.

Number	Term	Aggregation level
3	Obstetrics	1
3.1	Midwives	2
3.1.1	Certified midwife	3
3.1.1.1	Certified midwife (technical college)	4
3.1.2	Midwife in training (technical college)	3
3.2.2.1	Midwife in training (technical college)	4
3.2.2.2	Midwife in training (technical college)	4
3.2.2.3	Midwife in training (technical college)	4
5	Nursing care	1
5.1	Registered nurses	2
5.1.1	Certified registered nurses	3
5.1.1.1	Certified registered nurses (technical c	4
5.1.1.2	Certified registered nurses (higher tec	4

Table 10: Examples from the "LEP classification of occupations"

Healthcare professions can be organised according to the field of expertise and the level of education of the various professionals. A number is assigned for each classification level. Therefore, the system uses a four-place numeric code, just as with the main LEP classification and the other secondary classifications.

In a broader application context, occupation-specific analyses of service data can be used as the basis for recommended actions or for decisions relating to education and training in the various healthcare professions, but can also be used in research, by government ministries and departments, or by professional associations (e.g. to promote certain occupational fields or to create curricula). At the same time, international collection and comparison of service data in connection with the healthcare professions, e.g. relating to changes in the workforce or to the need for skilled labour, is a topic of growing interest (KLDB, 2011, p. 15).

Therefore, efforts have been made in the construction and ongoing development of these secondary LEP classifications to maintain a high degree of compatibility with the international classification of occupations (ISCO-08) and the ability to construct mappings easily (FSO, 2014b; Dal Poz et al., 2009, pp. 14–21; ISCO, 2012). This ensures that statistics on how these occupations are carried out can be compared at an international level (FSO, 2014b; ISCO, 2012).

2.3.4 Personnel work time and absences

The secondary LEP classification "Personnel work time and absences" classifies the breaks, absences and holidays taken by healthcare personnel (Table 11).

Number	Term	Aggregation level
5	Working hours / labour time	1
5.1	Break	2
5.2	Absence and leave	2
5.2.1	Absence and leave	3
5.2.1.1	Occupational accident	4
5.2.1.2	Anniversary of service	4
5.2.1.7	Sickness	4
5.2.1.8	Military service	4
5.2.1.9	Maternity leave	4
5.2.1.13	Paid leave	4
5.2.1.14	Unpaid leave	4

Table 11: Examples from secondary LEP classification "Personnel work time and absences"

It is only used if the corresponding data needed for analyses, e.g. for determining net work times, cannot be automatically extracted from a personnel deployment planning (PDP) system, as is usually the case. The time type is a default value, "D", and has a zero value (cf. Table 7, p. 29). The classification has a hierarchical structure and comprises four numerically coded classification levels, like the structure of the main classification and the other secondary LEP classifications.

3 Classifications, instruments and standards that complement LEP

Alongside the LEP classifications (see section 1.2, p. 4 and section 2, p. 16), useful service and case data from other classifications, instruments and standards are used for extensive and detailed statistics with LEP. LEP's compatibility with other classifications and instruments is established via links and mappings (ISO 2013; cf. Fig. 2, p. 5).

3.1 LEP and international standards

Patient information in an eHealth context should be communicated consistently throughout the healthcare supply chain and across institutions (ALIS Connect, eHealth Suisse & VGIch, 2011). An uninterrupted flow of information with IT support requires both a uniform data structure and a uniform semantics (terminology). International developments and experience have a beneficial influence on the use and ongoing development of LEP.

In LEP, the goal is to ensure usability with existing international standards by establishing a high degree of compatibility with those international standards and the ability to construct mappings easily. This approach is of central importance for the exchange of LEP data. To improve structural interoperability in electronic data exchanges, LEP Nursing 3 is structured according to the guidelines of the ISO reference terminology model, as mentioned earlier (see section 2.2.3, p. 21; ISO, 2014, p. 9-13). Breaking the names of LEP interventions down into individual elements ("atomisation"; cf. Table 6, p. 28) lays the foundation for structural interoperability by allowing the elements to be reassembled in different ways in accordance with different standards (Baumberger et al., 2012; Bointner,

2008, p. 5). To simplify the electronic exchange of healthcare data, LEP is also registered in HL7 by means of an object identifier (OID). HL7 stands for "Health Level Seven", a series of international standards for electronic data exchanges between organisations in the healthcare sector and their computer systems. An object identifier (OID)[16] is a sequence of numbers used to uniquely and permanently identify an information object – in this case, objects from the LEP classification of services – on a worldwide level. The LEP Nursing 3 OID is as follows: 1.2.276.0.76.5.391 (DIMDI, 2010)[17].

To improve semantic interoperability, LEP Nursing 3 is mapped to the nursing interventions in the ICNP (cf. Fig. 11, p. 36; Baumberger, 2013a; Baumberger, 2013b; Baumberger, 2015a; Baumberger et al., 2015; see section 10, p. 120). ICNP and LEP are two complementary terminologies for nursing interventions; they are not mutually exclusive, nor do they compete with one another. The ICNP represents nursing terms that are used in local, regional, national and international nursing practice, and integrates them into a common reference terminology. For example, alongside LEP® Nursing 3, commonly-used classifications used in nursing practice in German-speaking countries include apenio®, DiZiMa®, ENP®, NANDA-I® and POP® (FOPH, 1994, updated 2014; Dykes et al., 2009).

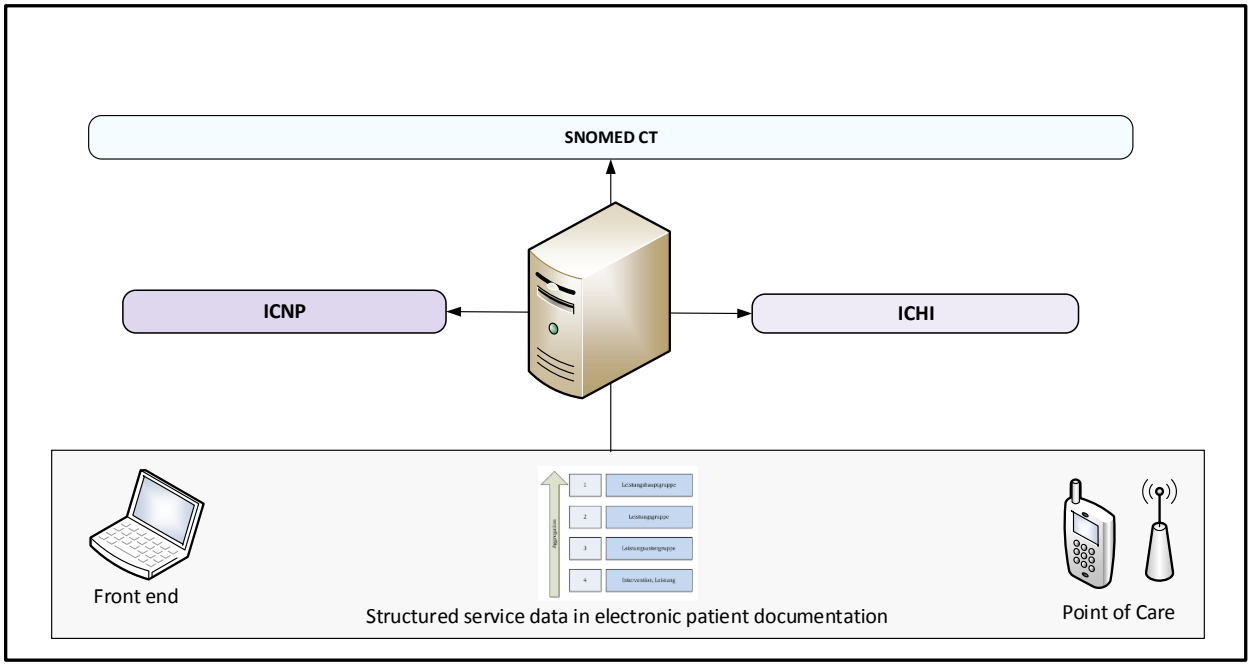


Fig. 11: Semantic interoperability with LEP Nursing 3

Looking to the future, LEP interventions will also be mapped to the interventions in SNOMED CT (Baumberger, 2016; IHTSDO, 2014) and – when available in a definitive version – to the interventions in ICHI (WHO-FIC Family Development Committee, 2012).

For example, if different classifications are used for nursing interventions in an eHealth context, they can be harmonised by means of a mapping with ICNP (Dykes, Dadamio & Kim, 2012; cf. Fig. 12).

[16] Registration identifier as per DIN 66334:1996-9 and ISO/IEC 9834-1:1993-2004.

[17] The identifier is structured as follows: iso (1) member-body (2) germany (276) din-certco (0) healthcare (76) coding-scheme (5) lep-nursing-3 (391).

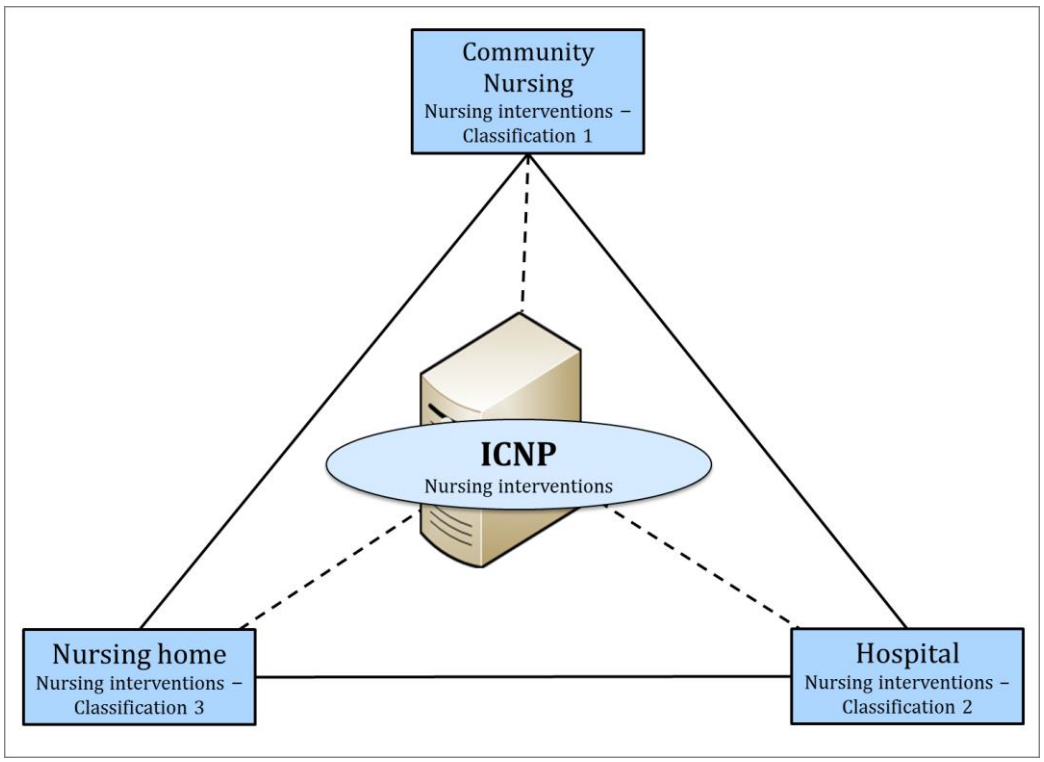


Fig. 12: Mapping from LEP to the ICNP reference classification (modified following Ostermann, 2016)

3.2 LEP and the treatment process

The treatment process can be subdivided into core stages, e.g. intake, diagnosis, therapy and discharge. The instruments and classification systems used in the diagnosis and therapy stages relate to the assessment, the diagnosis, the goal of treatment, the intervention and the outcome (cf. Fig. 13, p. 38). It is important to bear in mind that the treatment process is a complex one, and can be viewed from any number of different perspectives, but that the process is sharply reduced here (Ammenwerth, 2003). Here, the focus is on instruments and classification systems that are used in the treatment process.

The two theoretical constructs that define the treatment process are, firstly, the *state of health* of the individuals receiving healthcare interventions, and secondly, the *interventions* that professional service providers perform with, on or for these individuals (NLM, 2016b; WHO-FIC Family Development Committee, 2012). It is also known that interventions can have an effect on the state of health.

In the LEP context, a *link* refers to the connection between a technical concept in one classification system with a technical concept in another classification system, with a focus on the logic of clinical practice. These classification systems also contain various theoretical constructs, e.g. terms for healthcare interventions are associated in a clinical context with terms for states of health. In the LEP treatment process, for example, nursing diagnoses ("Orientation disorder") are linked with interventions ("Provide orientation training") (cf. Fig. 13, "D to I").

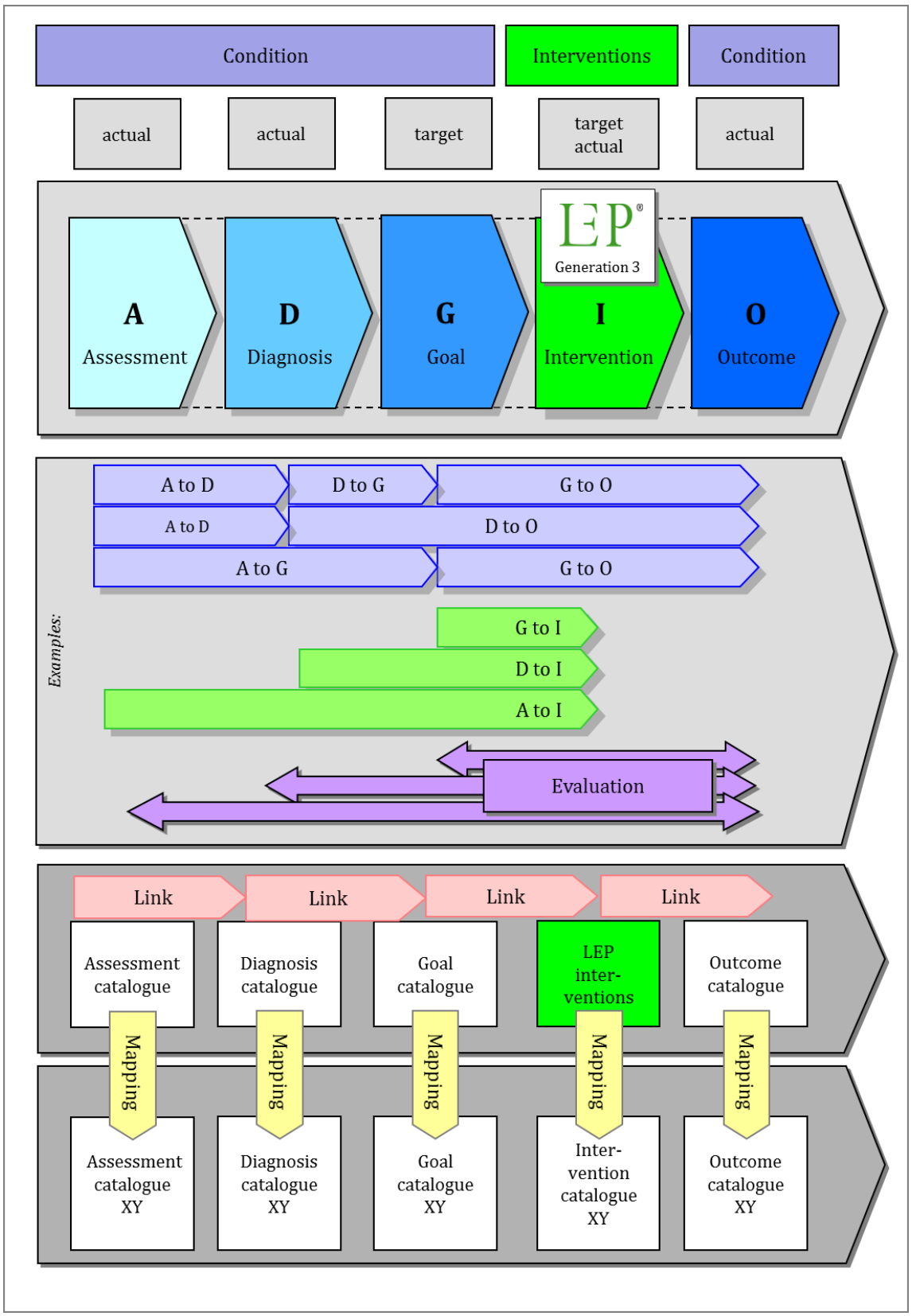


Fig. 13: LEP interventions in the context of the treatment process

The links between the interventions from the LEP classification of services and the health statuses of assessment, diagnosis, goal and outcome establish a direct connection between the different sub-processes within the treatment process (Fig. 13, cf. Fig. 33, p. 86). This provides a way for services to

be clinically justified, more effectively reviewed with regard to their effectiveness or appropriateness, and so on. As LEP products, for example, nursing diagnoses in NANDA I are linked with the nursing interventions in LEP Nursing 3. Or: Looking forward to the future, states of health in ICF will be linked with the interventions in LEP Physiotherapy.

In addition to the links, Fig. 13 also shows the *mapping*. In LEP, a mapping refers to the projection of a technical concept in one classification to the closest concept in another classification system. These classification systems contain the same theoretical constructs, e.g. terms for healthcare interventions or for states of health are placed in a single semantic context. LEP mappings serve to control the transformation of LEP concepts into and from other classification systems (Aronson, 2006; IHE, 2015; ISO, 2013, S. 7; Mayr & Petras, 2008).

LEP interventions are mapped to other classifications of interventions. As products, for example, the nursing interventions from LEP Nursing 3 are mapped to the nursing interventions from ICNP (Baumberger, 2013a; Baumberger, 2013b; cf. Fig. 12, p. 37; see 10, p. 120). Looking forward to the future, interventions from LEP will also be mapped to interventions from ICHI or SNOMED CT.

3.3 LEP and billing systems

LEP allows for comprehensive cost-centre and cost-unit-oriented recording of services. In addition, LEP data can be used for cost calculation and the DRG cost weighting calculation process (Klauber, 2004; SwissDRG AG, 2007, p. 4).

A direct relation to certain billing systems is established through LEP by means of links and mappings (see section 3.1 oben). This makes it possible to automatically trigger billing- or revenue-related coding criteria from patient documentation. Service data can be automatically transferred for cost unit and cost centre accounting (cf. Fig. 25, p. 71).

Depending on the billing system, services are named differently and evaluated differently for financing purposes. A “matrix table” is a useful way to present typical differences (Vitt, 2002, pp. 82–85). Table 12 below shows an example of LEP services as related to the financing of services in the long-term care domain in Switzerland (in-patient or nursing-home care, Art. 7, Definition of the service domain; EDI, 2015, pp. 8–10).

Name of LEP service	A-Service	B-Service	C-Service	Accommodation	Support
Performing movement/mobilisation at bedside			x		
Performing mobility training			x		
Measuring CVP		x			
Performing capillary blood collection		x			
Dispensing advice on pain managemen	x				
Providing / clearing away a beverage				x	
Facilitating a walk					x

Table 12: Services in different billing and financing systems

Links and mappings establish direct relations from LEP services to the G-DRG and SwissDRG system. This makes it possible to derive revenue-related criteria directly from patient documentation, thereby eliminating an additional level of documentation effort (Ahrens, 2012, pp. 395–396; VPU, 2009).

With LEP, revenue-related coding criteria for SwissDRG are triggered through CHOP code 99.C1 (Studer, Bürgin & Baumberger, 2015, pp. 333–334, 337–339). As with the PKMS, CHOP 99.C1 triggers a score for complex nursing care interventions (Baumberger & Portenier, 2013). The LEP interventions are mapped to the interventions from CHOP 99.C1 (Fig. 14).

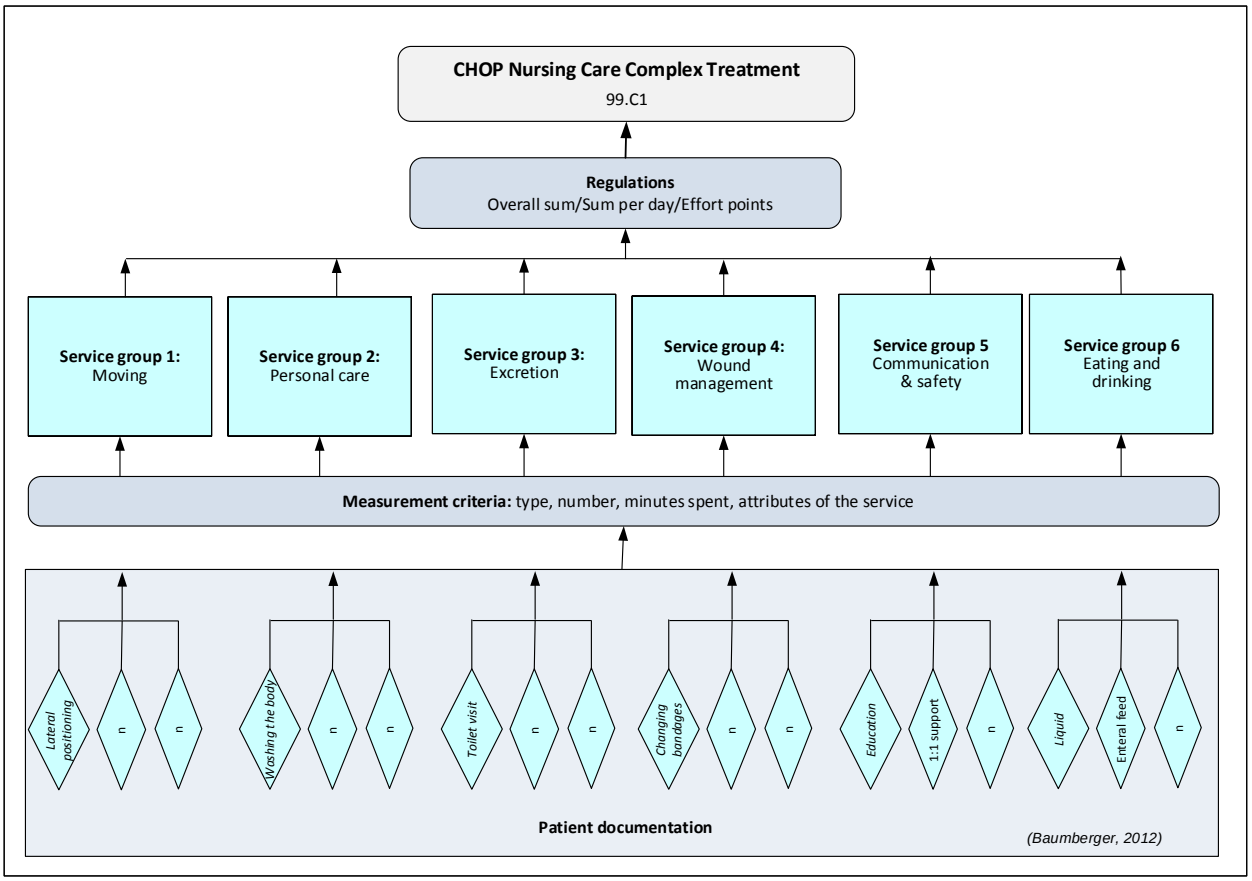


Fig. 14: Automatically deriving revenue-related SwissDRG criteria

Direct mapping of LEP interventions entered in patient documentation to revenue-related billing categories also makes it simpler to review transparency in patient documentation (Frick & Baumberger, 2015).

Revenue-related criteria are triggered for the G-DRG system with LEP through the PKMS/OPS. The PKMS is a score for complex nursing interventions (Wieteck, 2015). The LEP interventions are mapped to the PKMS interventions. The so-called "reasons" for PKMS interventions are recorded either with the secondary LEP classification for organisation-specific addenda (see 2.3.1, p. 31) or with an assessment (cf. Fig. 13, p. 38; e.g. ePA-AC) (VPU, 2009).

In addition, certain individual organisations establish systematic relations from LEP to other revenue-related criteria using ICD, OPS or CHOP, allowing for automated recording from patient documentation.

There is a strong potential with other occupational groups as well for direct relations to the revenue-related criteria relevant to them in case-based lump-sum billing systems.

3.4 Subjective evaluation of workload

Based on a subjective evaluation of workload (known in the LEP context by its German acronym, SEAB), service providers evaluate their workload for the relevant period of work time (e.g. shift; workload in hours) on a scale from 1 to 7. The median value, 4, corresponds to the subjective evaluation of the situation in which the healthcare professional providing services was able to complete all tasks arising during a shift (including services without case assignment) at a reasonable pace, at a professional level of quality, within the available work time and in a comfortable working environment. A value of 1 expresses a subjective feeling of the lightest possible workload, while a value of 7 expresses a feeling of the heaviest possible workload.

In conjunction with the collected time values, the subjective evaluation can provide additional information about the workload imposed on healthcare professionals and an organisational unit (Brügger, Bamert, Maeder & Odermatt, 2002a, pp. 16, 32). In particular, the difference between the workload calculated in terms of time and the subjective evaluation of workload can be helpful in making decisions for management and support processes, e.g. from an occupational health management[18] perspective.

3.5 Knowledge support

An important factor contributing to the quality of treatment in healthcare organisations is the deployment of relevant expertise to support healthcare professionals' practical skills in the treatment process, through the use of knowledge management in healthcare organisations (e.g. Rebscher &

[18] Disability management

Kaufmann, 2014; Schröder & Mundwiler, 2010). For instance, knowledge management can be presented as a "driver of quality in the healthcare domain" (Paxmann, 2015).

A variation on this approach is the direct use of practical knowledge (Kruse, 2004; Wiater, 2007) for LEP healthcare interventions in patient documentation (cf. Fig. 15).

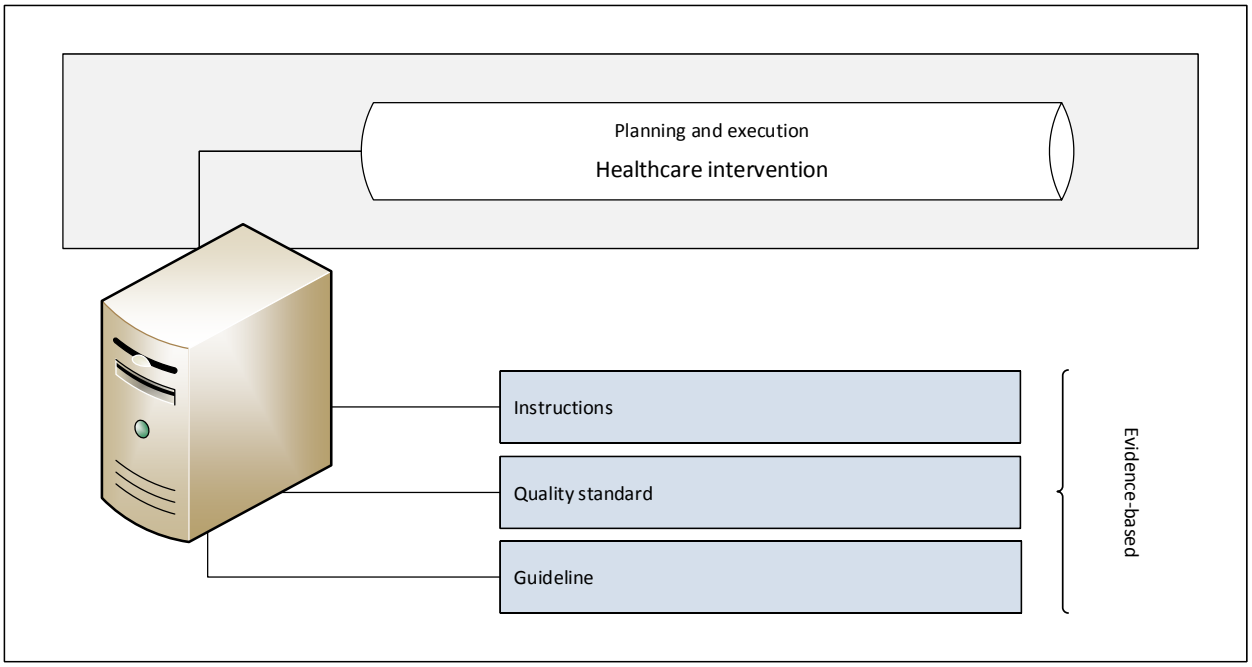


Fig. 15: Knowledge management for healthcare interventions in patient documentation

When a healthcare professional plans or performs an intervention in patient documentation, they can use a direct cross-reference (URL, hyperlink) to the knowledge database (Fig. 15). For the LEP healthcare interventions "Performing nest positioning", "Inserting a urinary catheter", "Dispensing advice on falls", or "Providing exposure training", evidence-based knowledge is then made available in the form of instructions for action, quality standards or guidelines. The challenge here lies in making practical knowledge available to healthcare professionals in a way that effectively supports their day-to-day work with existing knowledge, so that healthcare interventions can be carried out at a high level of quality.

One possible way to achieve this is to use a direct link between LEP interventions and PPN (Practical Procedures in Nursing; PPN, 2016) in patient documentation. Evidence-based knowledge from PPN provides efficient, targeted support for high-quality planning and execution of LEP interventions. Important knowledge elements here include instructions with references to responsibilities and materials, knowledge articles and summaries, knowledge tests, and legal and ethical guidelines. PPN also provides diagrams, animations and videos to illustrate how the interventions work.

Other efficient applications of knowledge support are provided through direct links from LEP interventions to existing, organisation-specific knowledge bases.

4 LEP analyses

LEP can be used for organisations of any size to generate service statistics, and can be customised for each individual healthcare organisation. Thanks to its modular structure (building block design), LEP can be custom-tailored to the tasks of each healthcare organisation, and modified, extended or reduced in case of changes. Analyses are essential to completing tasks within the operational processes that are supposed to be taken care of through the use of LEP (Fig. 16).

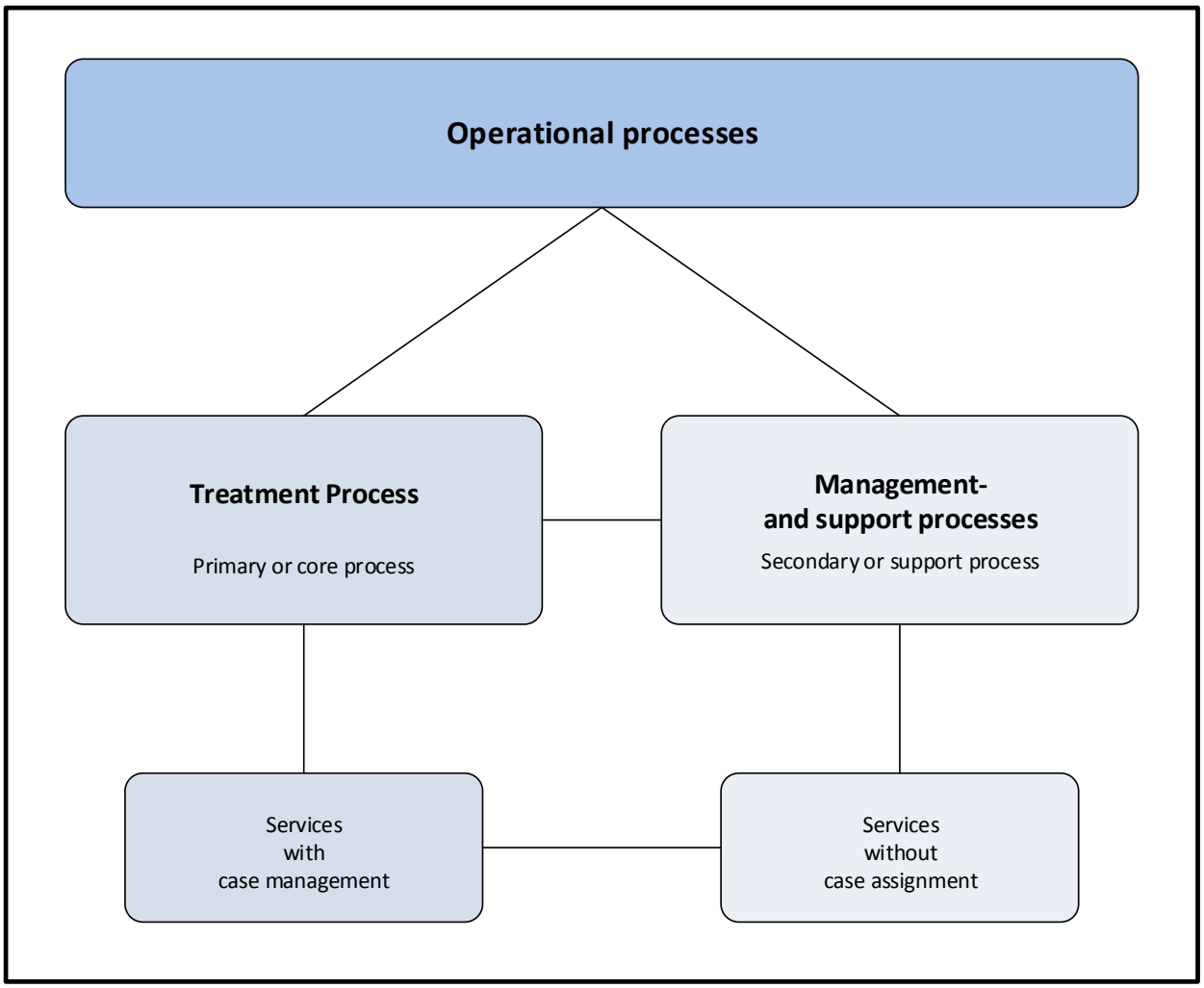


Fig. 16: Analysis of LEP service data to support operational processes

The LEP classification of services allows for consistent recording of services and times that covers all operational processes. These analyses can be used for all work processes carried out by healthcare professionals (see Fig. 16 oben). In analyses of healthcare organisations, services are related to particular dimensions established by the organisations (e.g. the analyses support various invoicing-related service types, depending on the particular operational process). For example, appropriate service types or time values can be invoiced in internal or external projects in an order-and service-specific manner, and backed by supporting data.

The LEP classifications provide the data that form the basis for these analyses, complemented by additional classifications, instruments and standards (see section 2, p. 16 and section 3, p. 35). Together with the additional organisation-specific data used for the associated individual analyses, (e.g. data relating to the cost centre receiving the service, or the occupation of the service provider), a broad foundation of data is established. The wide variety of questions and issues faced by healthcare organisations can be statistically analysed in distinct ways at LEP's different levels of detail.

The results of the analyses at different levels of details can be used as indicators not only in the treatment process itself, but also in healthcare organisations' management and support processes (cf. Fig. 16 oben). In analyses of the treatment process, for example, LEP services with data related to patient status, such as assessment scores, diagnoses,

treatment goals and outcomes are combined for quality tests, allowing conclusions to be drawn about the effectiveness of the services. Quality analyses are performed in parallel, e.g. the following questions are asked for the service "Positioning in case of apoplexy": "Are services performed at the right time in accordance with guidelines?" Or: "Is the number of services respected?" In other analyses, the LEP services are combined with personnel-related data such as occupation, level of education and work time to optimise staffing levels in the treatment process. In this case, questions like "Which occupational group performs the service at what times?" must be answered on the basis of data. The above examples show that LEP analyses can be used to provide clinical justification for services, or allow services to be assessed for effectiveness, or interpreted in connection with the staff's skill and grade mix.

4.1 Uniform definitions and formats

To ensure a uniform data foundation for analyses with LEP, the necessary data and formats are comprehensively described through the LEP standard export data and variable definitions (compare with Table 14, p. 49 and Table 21, p. 77). Based on this foundation, LEP has developed its own standardised analyses. However, the data foundation for analyses also makes it possible for any healthcare organisation to integrate the consistently defined and formatted data into its own existing analyses for organisation-specific questions, add to standardised analyses from LEP, or initiate new, organisation-specific analyses. For example, pivot tables[19] can be created in order to bring complex LEP datasets together in a table and filter them, relate them to each other in different ways, and analyse them according to the healthcare organisation's own specific questions and issues, all without having to modify the original data.

It is important to note that personal data may only be analysed in ways that respect each country's laws and regulations. Even if statutory provisions are respected, it is recommended that you only

[19] So called because they allow users to "pivot" or rearrange data to represent complex datasets in a more readily comprehensible way.

record and analyse personal data that are strictly necessary to complete the analyses that the healthcare organisation wishes to perform. All information must always be anonymised in such a way as to make it impossible to relate it to any identified or identifiable person.

4.2 Interpreting the results of analyses

Results of analyses of service data must be interpreted, i.e. a particular meaning or content-based explanation must be read out of the results or figures. It is important to develop a common interpretation procedure, to the extent this is possible, in order to arrive at a common interpretation or understanding. Every analysis must be followed by an interpretation. An interpretation must be followed by decisions, which must then be successfully implemented by the affected persons working together.

In general, all outcomes can be interpreted in multiple ways. The interpretation of the outcomes of healthcare services depends on the perspective of the individual interpreter, who assigns a certain significance to the numbers in the analysis. Patients, service providers, service remuneration providers, government authorities or industry representatives view these services from different perspectives. For example, three different approaches may be placed in the foreground when interpreting healthcare services: The patient's perspective is focused on optimal treatment; that of the healthcare professionals is focused on services that are medically and therapeutically appropriate and effective; and the perspective of financial professionals is focused on the cost-benefit ratio. Other interpretations can come into play with a perspective that is focused on avoiding negative effects on third parties, or on avoiding rationing.

The lack of a broad-based and uniformly accepted definition of the concept of "productivity", and of approaches to measuring productivity in relation to the treatment process, makes interpreting the results of analyses more difficult (compare with section 6.3 "Partitioning based on personnel work hours and costs", p. 80). The focus is generally on a quantitative comparison of the service provided and the resources used to provide it, i.e. of input and output; due to the immaterial nature of the product in the case of healthcare interventions, the "output" here is often referred to as an *outcome*. Seen as a product, a "healthcare organisation service" is made up of a certain number of different goods and services: In a hospital, for example, treatment, research and emergency services, training services and accommodation services are the most important. Given these many different services, it does not seem appropriate to subject all this variety to a single-factor approach to the interpretation of analysis results (FOPH, 2005; BaRos, 2011, p. 3; OECD, 2009).

It is also important to note that examining the productivity of an individual healthcare organisation is not sufficient. Similarly to how the productivity of the treatment process in a hospital is influenced by services at earlier stages, e.g. by the quality of nursing care in the admitting healthcare organisation, the services performed in the hospital also affect later stages of treatment, e.g. the services provided at a rehabilitation centre following the hospital stay. The connections between the individual

stages of treatment also have an impact on productivity, namely on the added value provided by all organisations that make up the value chain. In addition, despite current and past research efforts, there is still no integrated approach to the analysis of productivity in a hospital, for example (BaRos, 2011, pp. 26–27).

Another perspective considers the question of healthcare professionals' productivity within an organisation, and in particular, the question of how this value can be determined in a data-driven way. In order for cost rates that are relevant to a given healthcare organisation to be available for costing processes, the time spent on services that can be attributed to a case must be analysed. These are then divided by the number of hours for which the healthcare professionals were present (cf. Table 2, p. 11 or Table 23, p. 83).

If the interpretation of analysis results at a healthcare organisation or in the healthcare industry is reduced solely to the perspectives and associated interests of individual users, there is then – as is well-known – a very high risk that significant limitations will arise with regard to the motivation to record data and the quality of the data themselves. To ensure that service providers are motivated and supported in their day-to-day work, this (also) requires the availability of indicators and interpretations that are meaningful from their perspective. If the service providers who have to document the data for an analysis, or even make an extra effort to collect those data, are able to provide active feedback on the results or an interpretation of the results that makes sense from their point of view, their motivation will be high, as will the quality of the data. Interpreting results, making decisions based on the interpretation and implementing appropriate measures can quite reasonably be seen as an "art". On the other hand, there is also the danger that the growing range of software-based possibilities in healthcare organisations will lead to an ever-increasing number of analyses being added (thereby generating even more additional effort), but that stakeholders will not "work" effectively with the results of those analyses, i.e. that they will not interpret the results of the analyses, make decisions and implement solutions. Interpretations of results should always flow back in a "data cycle" to the people who document and collect those data – i.e. to the healthcare professionals, in most cases.

4.3 The LEP analytics modules

The analyses standardised by LEP (cf. Fig. 17 unterhalb) consist of

(1) the LEP standard assessments,
(2) the LEP data comparison, and
(3) the PCAP Suisse data comparison.

The LEP standard assessments form the foundation of the LEP analyses, as basic assessments on which the LEP and PCAP Suisse data comparisons are built in a modular fashion.

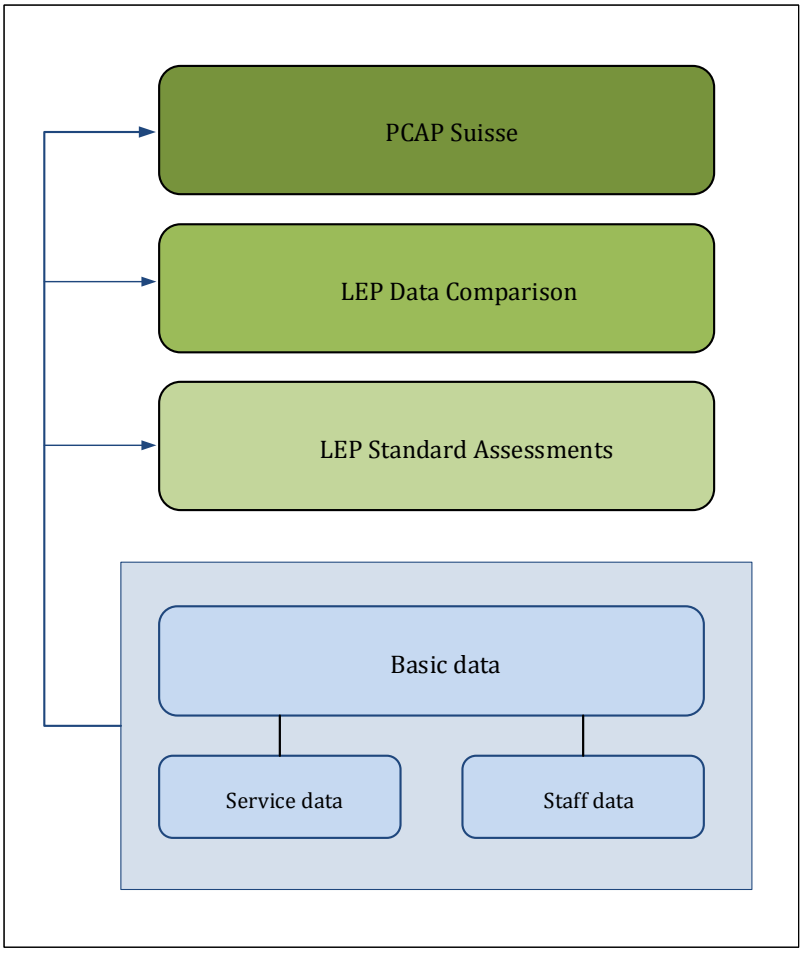


Fig. 17: The LEP analytics modules

As we can see at the right in Fig. 17 oben, standard requirements are imposed on the necessary data ("export data"), and on the variables, data fields and data formats (cf. Table 21, p. 77). For the analyses standardised by LEP, the calculations are also defined in R scripts. Together with the test data, they are made available to software partners as *tools* for implementing LEP analytics. R is a programming environment that is extremely useful for a broad range of statistical analysis operations. R is freely available, and statisticians around the world are continually adding to it. R is frequently used to develop and share new statistical methods (Stahel, 2015).

In principle, every LEP software partner that uses LEP for patient documentation and/or recording of services has the option to implement the standardised analyses based on LEP. LEP makes the documents that we have already mentioned several times in this handbook available to software partners for implementation purposes, and advises the software partners on achieving a successful implementation. Upon request, LEP AG will review the implementation of LEP analytics in the software based on certain specification criteria. It then prepares an official certification of proper implementation, as well as a report.

Preparations are currently under way to include a routine review of the implementation of LEP analytics in the software based on certification criteria, and an official certification of proper implementation and preparation of a report by LEP AG.

4.3.1 LEP standard assessments

Each standard assessment has its own number, e.g. 2121 for "Default nursing care outlay and actual nursing care outlay per service group" (Table 13).

Proposed and actual nursing care workload (2121)	
User query:	Are there differences between the actual nursing care workload and the proposed nursing care workload?
Observational unit:	Day of service (DS)
Short description:	The LEP service workload with case assignment is calculated for each LEP service group, based on 1. proposed times (planned duration) 2. recorded LEP times (actual) and compared to obtain the difference. In hours per DS
Software comments	
Software requirements	Data filtering, data aggregation, calculation of totals and mean values, drawing of scatter diagrams

Table 13: Example from the description of the LEP standard assessments

"Are there differences between the actual nursing care effort and the default nursing care effort?" To help answer this question, data are exported from patient documentation for use in analytics, in order to identify differences between the time spent on the services as provided and the time planned for those services. For example, large differences resulting from less time spent on the services actually provided could then be interpreted to mean that services "with, on or for the patient" were not performed in accordance with the relevant quality standards.

Based on the LEP standard export data (see examples in Table 21, p. 77), the data for each assessment are aggregated and calculated in different ways, depending on the question under consideration. Extensive information is available for each assessment: besides the calculation in the R script based on test data, there is the question to be assessed, the definitions of the variables and data that are used, the observation units, a brief description, comments for the software developers, and requirements for the software. Also available are explanations about the layout of the assessment, data filtering, tables and graphs, and statistical methods. All of this information is described extensively and in detail in specific LEP documents for healthcare organisations and software partners.

In the LEP standard export data for analytics, a fundamental distinction is made between:

- service data, i.e. LEP services at different levels of detail (see example oben in Table 13) and case data, e.g. assessments or diagnoses (see examples unterhalb in Table 14);
- service *providers* (the German abbreviation used in LEP data descriptors is *Erbr*) and service *recipients* (*Empf*).

In the core process for healthcare organisations, the provision of case-related services, the provider of the service is traditionally a healthcare professional and the recipient is a patient, e.g. for "Supine positioning" (see section 5.6, p. 62). For example, based on standard export data, we can analyse which occupational groups ("LErbrPersKat_key"; see number 37 under "Field name (short)" in Table 14 unterhalb) are performing which LEP interventions ("LEPEinzelleistung_key") with which patient ("FallID") for a given primary medical diagnosis ("ICDHauptdiagnose_key").

Number	Field name (short):	
37	**LErbrPersKat_key**	
198	**ICDHauptdiagnose_key**	
116	**LEPEinzelleistung_key**	
12	**FallID**	
	Variable definition	
37	Field name (short): Field name (long): Definition:	**LErbrPersKat_key** Personnel category ID – service provider The identification number for the profession of the person providing the service according to the LEP classification of services
198	Field name (short): Field name (long): Definition:	**ICDHauptdiagnose_key** ICD primary diagnosis ID The identification number of the primary diagnosis according to the ICD classification
116	Field name (short): Field name (long): Definition:	**LEPEinzelleistung_key** Individual service ID as per LEP The identification number of an individual LEP service/intervention at LEP aggregation level 4
12	Field name (short): Field name (long): Definition:	**FallID** Case number Identification number of the administrative case

Table 14: Example of LEP standard export data for core-process analyses

Of course, analyses for management and support processes in healthcare organisations can also be generated from the LEP standard export data, e.g. to support cost centre accounting including cost centre balancing (as distinct from cost unit accounting (H+, 2014)). To do this, data for the providing cost centre ("LErbrKST_key") are needed in addition to those for the receiving cost centre ("LEmpfKST_key") (Hug, 2012, p. 6).

Number	Field name (short):	
10	**LEmpfKST_key**	
32	**LErbrKST_key**	
116	**LEPEinzelleistung_key**	
12	**FallID**	
	Variable definition	
10	Field name (short): Field name (long): Definition:	**LEmpfKST_key** Cost centre ID – service recipient The identification number of the cost centre receiving the service, to which a service recipient, e.g. a patient or student, is assigned
32	Field name (short): Field name (long): Definition:	**LErbrKST_key** Cost centre ID – service provider as per staffing plan The identification number of the cost centre to which the service provider is assigned according to the staffing plan
116	Field name (short): Field name (long): Definition:	**LEPEinzelleistung_key** Individual service ID as per LEP The identification number of an individual LEP service/intervention at LEP aggregation level 4

Table 15: Example of LEP standard export data for core-process analyses

In this way, it is possible to analyse which cost centres ("LErbrKST_key") are performing which LEP interventions ("LEPEinzelleistung_key") for which cost centre ("LEmpfKST_key") (cf. Table 14, p. 49). On this basis, service-based cost centre balancing can be carried out with both unidirectional and multidirectional service relationships (Besson, 2013, p. 134). A unidirectional service relationship (cost centre apportionment) occurs when a cost centre provides services for one or more cost centres ("LErbrKST_key") without itself receiving services from the cost centres it serves ("LErbrKST_key"). A multilateral service relationship occurs when bilateral or multilateral service relationships exist between cost centres ("LErbrKST_key" and "LEmpfKST_key"). In other words, a cost centre not only delivers services, it also receives them from other mandatory cost centres (Besson, 2013, p. 134).

Data about task orders and the parties commissioning a task, e.g. for a research project that a company pays for, can also be entered and specifically analysed ("Auftrag_key" and "Auftraggeber_key"[20]). It is also possible to analyse the difference between the specified default time values (see section 2.2.6, p. 29) and the time values that are actually recorded, in order to either propose better default time values or e.g. to make adjustments as part of a process optimisation approach.

[20] The identification number for a task, e.g. for a project, an audit or a study on cardiac medication, and the identification number for the party commissioning the task, e.g. for a university, a person, a company, an institution or a pharmaceutical company, can be freely defined by the organisation using LEP. For example, the task can serve as the cost unit together with the party commissioning the task.

One final example relates to training. Here, as in the SAMS study (Kuster & Bamert, 2013), we can analyse the services ("LEPEinzelleistung_key") that students have provided ("LErbrPersonal_key") or received ("LEmpfPersonal_key"). Looking again at cost unit accounting, this analysis can be extended by adding data about cost centres ("LErbrKST_key", "LEmpfKST_key").

The above examples show the many different analytical possibilities available with LEP. In summary, LEP analytics can be used to analyse the type and number of services and the time spent on them, at various levels of detail and in relation to service providers, recipients and health statuses. In connection with these, additional variables can also be added in a targeted way to address different questions: services for multiple recipients from multiple providers, different cost centres, organisational units by location and specialisation, occupational groups, subjective evaluation of workload, or relatives as the parties commissioning a task.

4.3.2 LEP Data Comparison

Data comparison, and the associated requirements imposed on the data format and the data to be delivered by the participating healthcare organisations, are described in specific documents, as with the LEP standard assessments. To ensure comparability, a unified definition of notions like the unit type ("inpatient ward", "intensive care unit", etc.) and the department (see examples in Table 16) are important.

Department assignment LEP Data Comparison – Germany	
Number	Department
D100	Internal medicine
D101	General
D102	Geriatrics
D103	Cardiology
D104	Nephrology
(…)	
D200	Surgery
D201	General
D202	Trauma surgery
D203	Neurosurgery
D204	Vascular surgery
(…)	
D300	Gynaecology

Table 16: Extract from department classification in LEP Data Comparison for Germany

The most important explanatory variables in the LEP Data Comparison are the participating healthcare organisations and their division into unit and department types based on specialisations (cf. Table 17).

Organisation number anonymised	Primary specialisation	Unit type	LEP nursing workload total in hrs.	Nursing workload per day in hrs.	Movement	Eating/drinking	Doc./Admin.	Discussion	Safety	Laboratory sampling	Medication	Treatment	Subjective evaluation	Personnel time total in hrs.
4	D102. Internal medicine – Geriatrics	16. Private ward	11161.2	3.1	12.3	17.4	8.1	13.5	5.6	1.7	12.3	0.5	5.2	15276.5
4	D102. Internal medicine – Geriatrics	16. Private ward	5201.8	3.0	14.8	15.1	5.3	15.5	6.9	1.4	10.0	1.0	4.8	7082.7
7	D102. Internal medicine – Geriatrics	3. Inpatient ward	8298.9	2.3	13.1	9.4	11.2	6.5	14.3	3.1	14.1	3.6	0.0	14976.1
8	D103. Internal medicine – Cardiology	11. IMC	17277.7	2.7	2.3	13.5	12.6	4.1	16.5	2.8	16.8	8.7	4.1	18002.2
3	D103. Internal medicine – Cardiology	13. Observation ward	5971.8	2.0	1.3	7.1	18.1	8.6	22.5	0.9	10.1	6.1	4.2	10486.2
3	D103. Internal medicine – Cardiology	16. Private ward	6847.8	1.8	0.7	3.5	19.9	13.3	25.4	1.2	9.2	3.6	4.5	10007.7
1	D103. Internal medicine – Cardiology	3. Inpatient ward	15573.0	2.0	3.3	8.8	16.1	12.8	18.4	1.8	14.6	7.3	4.7	21903.0
3	D103. Internal medicine – Cardiology	3. Inpatient ward	9408.3	1.9	2.3	4.1	22.1	11.9	20.8	2.7	10.0	3.4	5.0	10604.3
4	D103. Internal medicine – Cardiology	3. Inpatient ward	9025.7	1.7	4.5	18.2	12.0	6.7	12.2	1.4	19.9	1.3	4.5	13254.8
6	D103. Internal medicine – Cardiology	3. Inpatient ward	14139.5	2.0	5.0	11.8	5.3	3.6	20.7	4.0	16.3	5.9		20446.5
7	D103. Internal medicine – Cardiology	3. Inpatient ward	13544.4	2.3	3.6	9.0	14.9	13.5	16.3	1.0	14.2	9.3	0.0	23412.6
7	D103. Internal medicine – Cardiology	3. Inpatient ward	7378.7	1.7	1.1	10.3	17.6	15.2	15.4	2.1	14.7	10.8	0.0	8387.8
3	D103. Internal medicine – Cardiology	5. Intensive care unit	13673.1	5.9	11.5	4.9	6.8	3.9	26.6	4.8	9.8	4.7	5.1	21174.6
3	D103. Internal medicine – Cardiology	6. Emergency unit	7095.1	2.2	3.2	4.3	18.3	10.9	28.3	1.9	5.5	2.4	5.0	13726.4
1	D104. Internal medicine – Nephrology	3. Inpatient ward	8653.0	2.6	8.9	8.2	8.5	5.6	11.7	2.9	18.8	3.2	4.2	10704.0
5	D104. Internal medicine – Nephrology	3. Inpatient ward	9496.8	2.0	8.2	14.0	6.2	4.0	7.3	4.1	17.9	5.5	4.2	14783.4
1	D105. Internal medicine – Haematology / Oncology	11. IMC	9244.0	6.7	2.9	4.3	7.3	7.4	26.3	5.6	28.1	3.3	4.5	10369.0
7	D105. Internal medicine – Haematology / Oncology	17. Outpatient clinic	10466.5	1.2	0.3	4.9	12.5	9.3	12.8	2.7	30.0	12.7	5.9	15294.2
1	D105. Internal medicine – Haematology / Oncology	3. Inpatient ward	18181.0	2.7	6.5	8.2	9.5	9.5	13.3	2.3	22.1	4.8	0.0	21865.0

Table 17: Extract from an LEP data comparison

Important target variables include the LEP service groups (movement, treatment, etc.), the times spent on services provided (nursing care workload), and work times, including the difference between nursing care workload and work times, as well as the subjective assessment of workload (SEAB, see section 3.4, p. 41).

4.3.3 PCAP Suisse

With the DRG-based LEP analytics module PCAP Suisse (Patient Care Analytics Platform), hospitals can do data-driven comparisons of their services in the context of flat-rate financing, identify strengths and weaknesses, and implement any necessary improvements. The PCAP Suisse analytics

module got its start in two hospitals.[21] The subject-matter content and the technical implementation are constantly and innovatively maintained and developed by a group of subject-matter experts consisting of representatives from the participating hospitals, a software company, and the Hochschule für Technik Rapperswil (HSR).[22]

In addition to the data from the first two analytics modules, DRG data are also used here in a targeted way as explanatory variables, along with the typical DRG target variables of service workload, costs and length-of-stay values, which are analysed and assessed e.g. with reference to the case mix, homogeneity or outliers (Fig. 18 unterhalb).

[21] University Hospital Zurich and Valais Hospital.

[22] From the beginning, maintaining a focus on actual practice was a major concern for the initiators of the benchmark. For example, they founded an advisory committee made up of expert practitioners from the participating hospitals and representatives from LEP AG's research and development division.

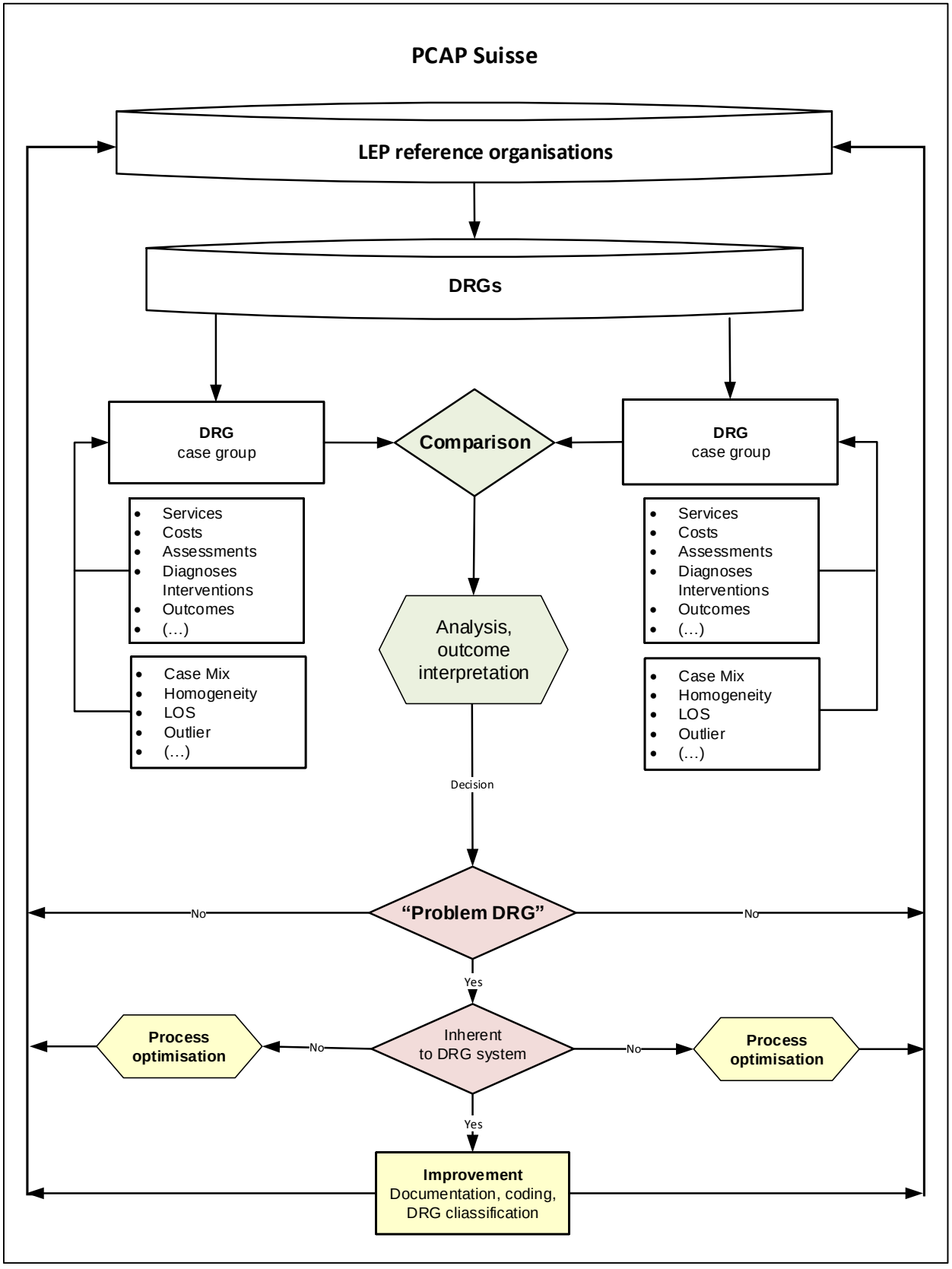

PCAP Suisse
LEP reference organisations
DRGs
DRG
case group
Comparison
DRG
case group
Services
Costs
Assessments
Diagnoses
Interventions
Outcomes
(…)
Case Mix
Homogeneity
LOS
Outlier
(…)
Analysis,
outcome
interpretation
Decision
"Problem DRG"
No
No
Yes
Process
optimisation
No
Inherent
to DRG system
No
Process
optimisation
Yes
Improvement
Documentation, coding,
DRG cliassification

Fig. 18: Model of DRG-based organisation comparison with PCAP Suisse

Based on service, case and cost data, PCAP identifies areas where healthcare organisations have potential for improvement, and the differences between them. Service processes can be assessed on this basis, and each healthcare organisation's potential for improvement can be used in a targeted way. In addition to process flows, DRG-related patient documentation and the coding of revenue-related DRG codes (e.g. OPS/PKMS, CHOP 99.C1) or of workload-related ICD secondary diagnoses can also be optimised. Data-driven suggestions for improving the DRG classification can be submitted to the DRG developers (Fig. 18, p. 55). Optimisation efforts are usually focused on process flows, however – "from admission to discharge". If improvement measures have been implemented, the effects of such measures can again be reviewed, analysed and assessed in a data-driven manner using PCAP Suisse, as shown in Fig. 18 (p. 55), thereby ensuring the continuity of the improvement management process.

As for the first two LEP analytics modules, each participating hospital delivers the data based on pre-defined criteria and standard export files (Table 18).

	A	B	C	D	E	F	G	H	I	J	K	L
1	FID	KATEGORIE	ABTEILUNG	STANDORT	DRG	CW	LOS	AUSTRITT_DAT	VERLEGUNG	LEP_TOT_MIN	Z31_MIN	Z32_MIN
2	1	UNI	RAD	A	K04A	1,991	6	30.09.2014	0	1903	165	181
3	2	UNI	RAD	A	I47Z	1,748	7	05.09.2014	0	1465	100	150
4	3	UNI	RAD	A	I43B	1,997	7	01.09.2014	0	2011	400	234
5	4	UNI	LAB	A	I47Z	1,748	6	01.09.2014	0	1229	45	96
6	5	UNI	LAB	A	I13C	0,863	5	01.09.2014	1	1299	210	185
7	6	UNI	ANAE	B	I08B	2,117	14	01.09.2014	0	7084	1300	755
8	7	UNI	ANAE	B	K04A	1,991	3	04.09.2014	0	1244	55	119

Table 18: Example file from a healthcare organisation for PCAP Suisse

Building on the data from the LEP standard assessments and the hospitals' DRG datasets, no additional data collection is necessary. The delivered data are systematically reviewed before the data analysis, based on pre-defined criteria. Cases with service data of insufficient quality are excluded and identified in the analytics report. The comparability of multiple LEP reference organisations is preserved.

On the user-friendly web platform for PCAP Suisse, and with the help of selection filters that are relevant for DRG analyses, each LEP reference organisation can compare its own service data with those of the other participating hospitals at various levels of aggregation (see example in Fig. 19).

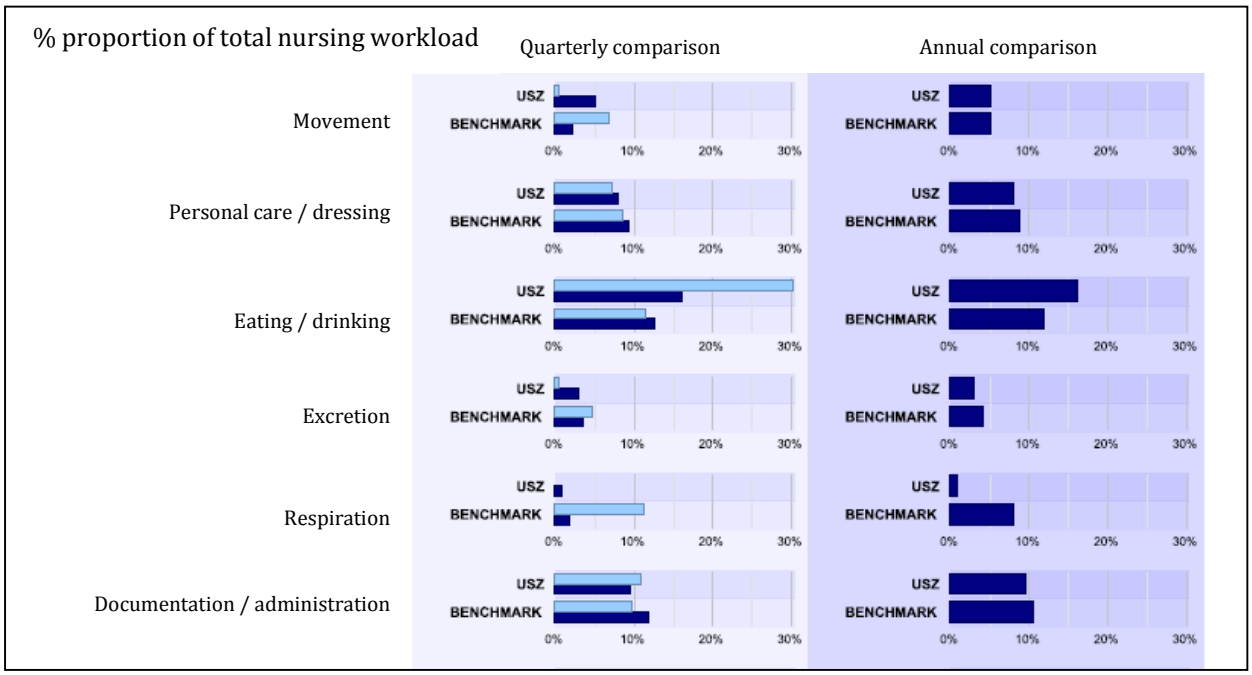


Fig. 19: Comparison of service groups within a DRG case group with PCAP Suisse

For example, hospitals can be compared to one another with reference to LEP service groups within DRG case groups with the highest nursing workload or the highest average length of stay. Or they can be compared with reference to the average nursing workload per case within DRG case groups with the highest number of cases.

In the PCAP user group, the results of the data comparison are interpreted and assessed with the participation of the advisory committee, and possible solutions and evaluation processes are also defined. The data for PCAP are updated regularly every quarter. PCAP also offers useful information from the local setting for an organisation-specific implementation of strategies.

The web platform for the analyses and for the creation of benchmark reports is based on two technologies. The entire web interface was developed by EPS AG, based in Wil (St. Gallen, Switzerland), on the node.js platform. Data administration, calculation of analyses and graphs, and documentation of the reporting component are maintained and developed by the HSR, based in the R software environment. The tools developed on the basis of these technologies communicate directly with one another on the server hosted by 4net AG. The node.js web service passes user requests along to the R tool, which responds to each request with all relevant information, analytics, graphs and reports. The web service formats the information as a web page, and the web browser then presents it to the user.

5 Application and use of LEP

Each healthcare organisation uses the LEP building blocks to put together a solution that is adapted to its perspective and optimised for its particular setting – whether it's for patient documentation, patient documentation with integrated recording of services, for recording of services alone, or for the statistics and analytics based on these (cf. Fig. 6, p. 17). LEP offers extensive flexibility in how it is set up, allowing each healthcare organisation to derive the desired benefits from its own specific application of it.

A healthcare organisation's decision as to the particular tasks for which it wants to use LEP is the starting point for any LEP application. The people who will use LEP to carry out their tasks must be taken into consideration for this decision, e.g. healthcare professionals in the treatment process, financial management and quality management staff, or staff from the controlling department.

The process of determining usage scenarios for the LEP application also includes deciding on the required data model, i.e. addressing the questions of what the data flow in the LEP application should look like, where LEP data will be stored, and what relationships will exist between LEP data and other data.

There is no *one* perfect LEP application. The innovation and development skills of the over 250 organisations using LEP, and of the 20-plus software companies that implement LEP, seem almost immeasurably vast. The work they are doing at individual healthcare organisations may well go beyond the potential uses laid out in the rest of this handbook. For example, this would apply when the "best" solution for an individual organisation cannot be carried over for all other organisations or as a standard for all applications. For example, links between LEP interventions and various classification systems for health statuses (nursing diagnoses, outcomes, etc.) do not yet allow for standard analyses that would be usable by all organisations using LEP.

5.1 Collect once, use many

An electronic patient documentation system should be used for much more than simply reproducing traditional paper patient documentation in digital form. Putting LEP into practice requires clever software solutions, but also the courage to only document what is truly essential, i.e. the information that is relevant for a successful treatment process. Once collected, data should be used in as many ways as possible for all operational processes: "collect once – use many times" (Hardier, Username & Jansen, 2014, p. 291; Schulz, 2011, p. 27). Healthcare organisations should make every effort to ensure that the data they collect are used. LEP-relevant data stored in an organisation's IT systems should not only be automatically carried over from other systems, but also transferred back out to such systems (cf. Fig. 25, p. 71).

In the course of the daily routine, various documentation requirements give rise to impressive quantities of data. Electronic documentation systems can record this type of routine data in a structured

manner and put it to use not only for the current treatment situation in the core process, but also for a wide variety of cross-patient issues for management and support processes. Reusing documented data in this way for purposes outside the treatment and nursing process (e.g. for research, process optimisation, risk management, financial controlling or personnel deployment planning) is known as "secondary use" (Hack, Baumberger & Jucker, 2016).

Secondary use or multiple use of routine data holds great potential, which of course go hand in hand with great challenges. These challenges must be addressed in order to use the data collected within a healthcare organisation in a meaningful way (Hack et al., 2016). This handbook presents examples of how a healthcare organisation's data can be used for the LEP analytics module. The possibilities and limitations of secondary and multiple use are also touched on, though only in part.

5.2 Collection time

As a general rule, data collection by healthcare organisations for analytic purposes in LEP is generally *retrospective* in nature, i.e. the analyses are primarily concerned with LEP services that have already been provided or carried out. However, data collection for analytics could just as easily be prospective in nature, i.e. users could choose to record required or planned services instead (IBES, 2014, p. 23). There are also LEP analyses in which services provided are compared with required services (see example in Table 13, p. 48).

The time period over which data are collected at healthcare organisations for use in LEP analytics can be ongoing, short-term, long-term or cyclical.

Independently of collection time, LEP data are collected on a continuum from partial to complete and from highly aggregated to highly detailed (cf. Fig. 1, p. 3).

5.3 Preselection of LEP content

In general, not all healthcare organisations will carry out all services from the LEP classification, nor the same services from one organisation to the next. Certain services are provided selectively, e.g. "Providing cooking class", "Supporting breastfeeding", "Performing roleplaying", "Dispensing stoma advice" or "Providing exposure training".

Healthcare organisations use filters to set up those services that are likely to be provided there, or that are likely to be needed for analytics. This is generally done at the level of specific departments of a healthcare organisation, e.g. for orthopaedics, acute psychiatric units, general geriatrics, teleportation, or neonatal intensive care units (FSO, 2008; German Federal Ministry of Justice, 1994; updated: 2015). For example, "Providing cooking class" would not be selected for documentation in an orthopaedics unit.

Based on the above restrictions, so-called *core sets* of interventions are established. They are easier for LEP users to keep track of, and reduce and simplify management processes and the range of available services.

In a targeted selection, the remaining services that are not likely to be performed are not “deleted”, but remain available for entries in patient documentation for exceptional cases in the practical use of the LEP application (e.g. “Supporting breastfeeding” in an orthopaedics unit). This service can be specially selected from the classification available in the software for the relevant occupational group, or from the full classification. The selection should be reviewed at least once per year.

5.4 Front-end and back-end LEP

For optimal use of LEP in patient documentation (cf. Fig. 34. p. 89) and recording of services, two basic variants are available:

- Front-end LEP

  In software and web applications, the term “front end” refers to the part of the software that LEP users see, namely the user interface. The LEP terminology is visible in the user interface, e.g. “Performing lateral positioning” is visible and documented i.e. entered into the software.
- Back-end LEP

  The back end is the part of the software that is responsible in the background for the program’s functionality and logic. LEP users do not see the back end directly. The LEP terminology is not visible in the user interface, e.g. “Monitoring blood pressure (BP)” is not visible or entered into the software. In the interdisciplinary part of a patient’s documentation (the “chart”), a value like 140/90 would be entered. In the back end of an LEP application, the service “Measuring blood pressure” is *automatically* recorded (Fig. 20).

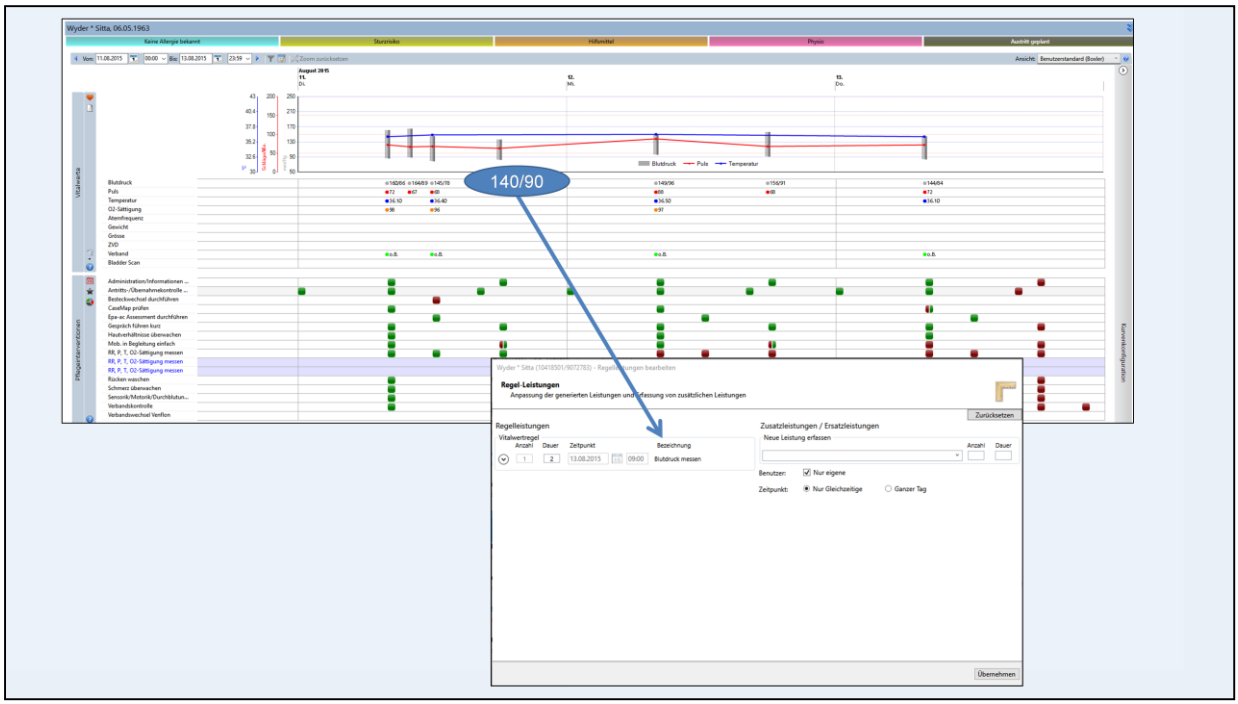


Fig. 20: LEP in the back end of patient documentation

The healthcare professional who enters the BP value in the patient documentation does not need to enter any additional or redundant data to record the service. In addition, the BP value is available to

all other healthcare professionals, so the motto “Collect once, use many times” applies from this perspective as well.

Entries in the chart as in Fig. 20, i.e. in the interdisciplinary part of the documentation (cf. Fig. 34, p. 89), are extremely important for automated recording of services with LEP. For example, besides the blood pressure value, the patient’s body temperature is also recorded with an LEP intervention (namely “Measuring body temperature”). When a temperature value is documented, this intervention can be recorded fully automatically in the back end for analytics purposes. Or the use of an eye drop product might be recorded with the intervention “Administering medication conjunctivally”. This is especially important in the acute physical/inpatient domain, since many delegated interventions (see section 5.5, p. 61) are documented in the chart here.

The distinction between the front and back end has to do with the visibility of the LEP application in the software. The content of the LEP classification of services remains identical. The terms are intended as useful dynamic descriptions of different components’ roles in the LEP application. In complex LEP applications, for instance, this means that a front-end component can become a back-end component, or can itself be divided into a front end and a back end. For example, in the documentation of the nursing process, LEP is used in the front end, but it is used in the back end in the chart; and at the same time, LEP intervention terms are mapped with the ICNP or SNOMED in the back end (cf. Fig. 21 unterhalb).

When LEP or other classifications are used in the front end, it can be considered as an *interface* terminology, and as a *reference* terminology when used in the back end. Such terms are ambiguous, however, since as we saw earlier, LEP can be used both in the front end and in the back end.

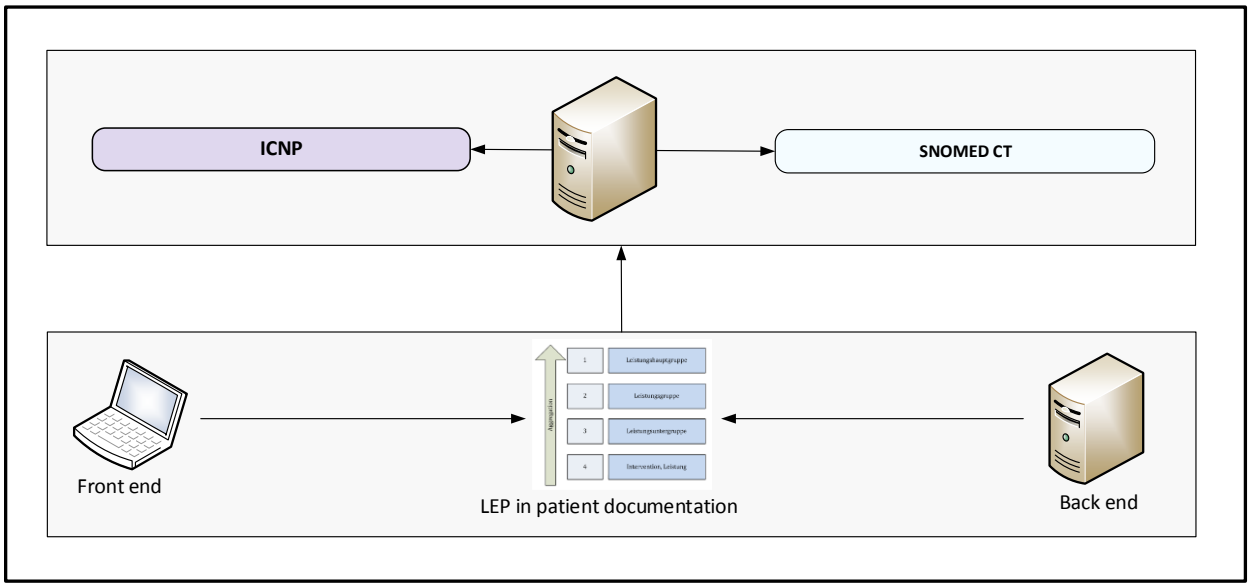


Fig. 21: LEP applications in the front end and back end of patient documentation

Intervention terms from another classification may be used in the front end of patient documentation that are then mapped to LEP in the back end. For complementary recording of services, the LEP intervention terms are seen in the front end.

5.5 LEP for autonomous and delegated interventions

Separating LEP services into autonomous and delegated service domains (cf. Fig. 22 unterhalb) can be useful for ensuring

- legal certainty and legal responsibility in the provision of services[23],
- a clear, specialised responsibility for each service provider,
- a clearly defined professional role for each service provider,
- alignment of responsibility and specialised skill in the provision of services,
- differentiated invoicing/compensation of services,
- targeted use of skilled resources,
- elimination of duplication and administrative effort,
- support for a workable delegation model in the domain of diagnostic and therapeutic interventions

(cf. GuKG, 2009, SBK, 2014).

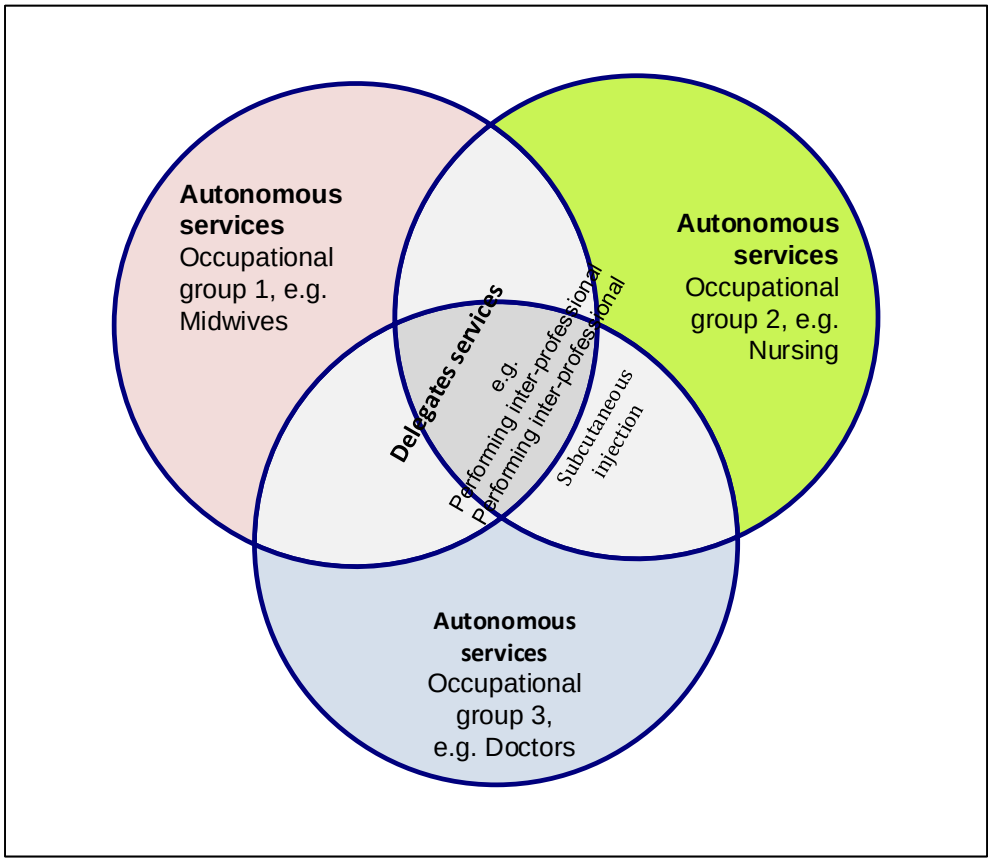


Fig. 22: Autonomous and delegated LEP services

The *autonomous* service domain includes the performance of services by any person authorised to practice a profession as part of their job description and in their capacity as an autonomous profes-

[23] e.g. adapting to statutory requirements such as healthcare or insurance laws.

sional. The professional responsibility and legal liability for the service lies with the relevant occupational group. For example, the autonomous nursing domain (cf. Fig. 22 oben) is defined by the nursing process. The autonomous service domain for nursing includes services like the determination of nursing requirements (nursing diagnosis), decisions about the nursing interventions to be performed (nursing care plan), and the performance of those interventions or the documentation of the nursing process (cf. Fig. 13, p. 38; Fig. 33, p. 86; Fig. 34, p. 89). This applies to the LEP intervention "Performing a partial body wash" or "Maintaining patient documentation", for example (cf. GuKG, 2009; SBK, 2014).

The *delegated* service domain includes the performance of services at the direction of another occupational group. For example, as the prescribing occupational group, doctors are responsible for issuing directions, while nurses are responsible for carrying out the requested service (implementation responsibility). This applies to the LEP interventions "Subcutaneously administering an injection" (cf. Fig. 22 oben) or "Performing nasal flushing". As seen in Fig. 22, there are also services like the LEP intervention "Performing inter-professional case review" for which the emphasis is not on responsibility, but on collaboration in the service process for the patient's benefit (cf. GuKG, 2009; SBK, 2014).

The LEP classification of services includes both autonomous and delegated services. In Austria, for example, LEP Nursing 3 interventions can systematically be assigned to the autonomous or delegated service domains defined in the Austrian Health Care and Nursing Act (Gesundheits- und Krankenpflegegesetz, or GuKG) (GuKG, 2009; Tauschitz, 2011). The LEP Nursing Process product contains autonomous services as well as instruments and classification systems for the assessment of nursing-related health statuses (e.g. assessments, nursing diagnoses) in the autonomous service domain.

5.6 "Provider and recipient" principle

In the core process of healthcare organisations, the provision of case-related services, it is traditionally assumed that the provider of the service is a healthcare professional and the recipient is a patient (cf. 4.3.1, p. 48).

In certain circumstances, the provider of a service may not be just a healthcare professional, defined as a single individual. The provider of a service may also be multiple healthcare professionals, or a group of healthcare professionals. For example, services like "Supine positioning" or "Performing leisure activities" can be performed by one healthcare professional or by a group of healthcare professionals (from different professions) (Table 19).

Individual or group	
Provider	**Recipient**
Healthcare professional	Patient
(…)	Family member
	Guardian
	Healthcare professional (“employee”)
	Task, party commissioning the task
	Cost centre
	Service remuneration provider (“insurer”)
	(…)

Table 19: “Provider and recipient” principle

Similarly, in certain situations, the recipient of a service may not be just a patient, defined as a single individual. The recipient of a service may also be multiple patients or a group of patients. For example, “Performing therapeutic play” or “Dispensing information” can be carried out with one patient or several.

Along the same lines, both the provider and the recipient of a service may in some cases be a group of healthcare professionals and a group of patients, respectively. For example, “Performing leisure activities” or “Performing therapeutic play” can be carried out by a group of healthcare professionals for a group of patients.

There are many other types of service recipients that are distinct from patients and that are relevant for analytic purposes, including both individuals and groups. For example, this would include the case of a nurse teaching a patient’s relatives how to provide diabetic foot care for the patient (education). In this situation, the relatives are the recipients of the service “Dispensing advice on diabetes management”, and the patient is the so-called “administrative case” or the “beneficiary”, in whose patient documentation the service is recorded. The patient benefits from the service, but the service recipient is someone else – the patient’s relatives, in the above example. The patient is normally the administrative case or the subject of the patient documentation. As a rule, patients are more commonly implied in the names for services than explicitly mentioned, as they are for the service “Locating a patient”.

Service recipients can also be people who are independent of a patient, such as other healthcare professionals with or without a degree, or students. This is the case for teaching activities like “Guiding/instructing employee” or “Conducting a learning situation”, for example (cf. Fig. 8, p. 21).

For analyses in support of cost centre accounting, a task and/or the party commissioning a task may also be relevant as service recipients (see Table 19 oben). For example, this may be appropriate when a company finances a research study and wants a specific analysis of the services provided for the study. In such a case, the party commissioning a task may serve as the cost unit for the services. The

name of the task or of the party commissioning it can be specified by the organisation using LEP. Other tasks might include services by healthcare professionals for the healthcare organisation's own projects or for quality management, e.g. "Implementing a project" or "Conducting an audit". For cost centre balancing, it can also be useful to enter or record the cost centre providing or receiving the service as appropriate (cf. Table 15, p. 50: "LErbrKST_key" and "LEmpfKST_key").

The ambiguous term "statistics code" is sometimes used when associating attributes to a service, e.g. when a provider or recipient needs to be associated to a service. This term should be avoided whenever possible; otherwise, it is essential to precisely specify for what purpose the term is used for each analysis, and how the services are to be recorded in each case (scope, level of detail). When recording services and times that are assigned to an organisation-specific project, we might then use the term "project time recording" to describe a situation in which healthcare professionals are collecting data in order to analyse how many hours have been spent on the project.

Various *different* service providers and recipients – whether acting as *individuals* or as a *group* – should be added in a targeted manner with an eye toward the desired analyses. They can then be systematically assigned to the services during entry in patient documentation or during the recording of services and times. This makes it possible to generate additional detailed data with LEP for organisation-specific analyses, e.g. as described above for services in projects or in the educational domain. Establishing the "provider and recipient" principle and applying it in a targeted manner with LEP allows for additional recording of organisation-specific values for all services. This opens possibilities to compensate and calculate services more precisely, and to implement new projects and tasks in a more targeted manner. It is therefore worthwhile to incorporate specific service providers into statistical analyses, as well as specific service recipients like family members or parties commissioning various tasks. In so doing, it is useful to take account of differences between multiple services performed at the same time, and especially between patient care, educational and research services.

5.6.1 Accounting for coupled services

So-called "coupled services" represent a special case of the provider and recipient principle. A "coupled service" refers to the performance of a service that is necessarily coupled to the simultaneous performance of some other service. In general, coupled services can be performed by all occupational groups, e.g. when someone performs a clinical activity and a teaching activity at the same time. Typical examples of coupled services in healthcare organisations include

- training services that are carried out simultaneously,
- research services that are carried out simultaneously,
- training, research *and/or* treatment process services that are carried out simultaneously.

With LEP, following REKOLE (Besson, 2013, pp. 234, 260-271), a pragmatic approach is used, i.e. services are recorded *without* using the so-called differential perspective (cf. Fig. 23 unterhalb, bar C).

The following guideline should be observed for the documentation and recording of coupled services with LEP:

- For the recording of services in the treatment process "on, with or for a patient" with a simultaneous "guidance/supervision" service: The service provided by the first person is recorded as a service with case assignment (e.g. "Dispensing advice" or "Administering a subcutaneous injection"), and the one provided by the second person is recorded as a service without case assignment (e.g. "Conducting a learning situation" or "Guiding/instructing employee").

The figure below (modified following Besson, 2013, p. 260) may be helpful for recording services with coupled properties (Fig. 23).

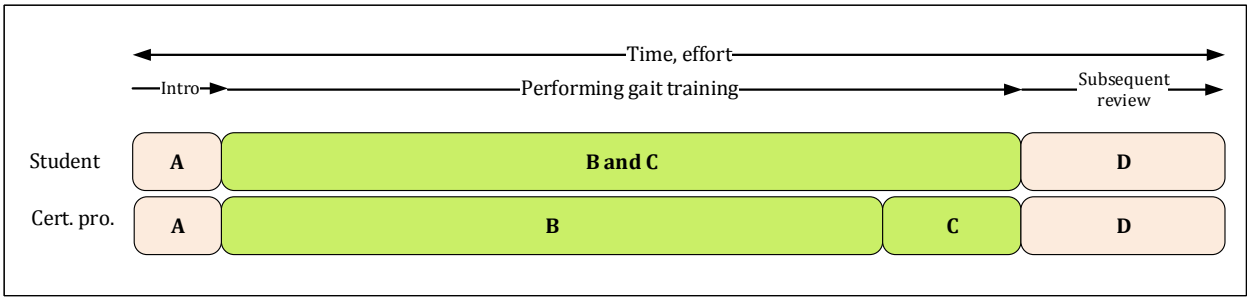


Fig. 23: Services with and without case assignment provided by two people

Fig. 23 shows an example of how a particular service provided by a student and a certified healthcare professional should be recorded. The student (trainee) provides gait training for a patient, and the certified healthcare professional (trainer) provides mentoring.

From a financial, effort-oriented perspective, we can assume an "ideal" time value that would be adequate for any certified healthcare professional to perform the service "Providing gait training". This corresponds to bar B in Fig. 23 and the LEP default time value (see section 2.2.6, p. 29), i.e. the time value B is not to be as an "unchangeable" standard value, since a variety of factors in healthcare organisations can affect the time needed to carry out a task. In Fig. 23, for example, the time needed depends on the patient for whom the gait training is being provided, and/or on the individual characteristics of person performing the service. The bar B+C in Fig. 23 represents the actual time needed by the student to perform the service, i.e. the time value recorded for "Provide gait training" would be modified accordingly from the LEP default time value. In the above example, there was also a training discussion at the start and end of the service in the form of an introductory conversation (represented by bar A in Fig. 23) and a subsequent review (bar D).

If time value B in Fig. 23 were the baseline value to be used in the recording of times and services for the student, we would have to record the values A + C + D for the training they received. For the recording of times and services for the certified healthcare professional, we would have to record the time values A + B + C + D for the training they provided. However, this so-called "differential perspective" is *not* used for recording with LEP, as mentioned briefly earlier. Due to substantial difficulties in determining an "unchangeable" baseline value B in practice (the bar labelled B in Fig. 23) and in

recording and keeping track of each individual person's contribution, a pragmatic approach is taken which does not attempt to use this differential perspective.

Returning to the example of recording services and time values for a student and a certified healthcare professional (Fig. 23), we would proceed as follows in LEP (cf. Besson, 2013, pp. 234, 260-271):

- Student:
    - Service with case assignment ("Provide gait training"): = B + C
    - Service without case assignment: Training received = A + D
- Certified healthcare professional:
    - Service with case assignment = none
    - Service without case assignment: Training provided = A + B + C + D

To take another example, suppose that the certified healthcare professional (cf. Fig. 23 oben) demonstrates the "Provide gait training" service to the student. The service and time values are then recorded as follows with LEP:

- Student:
    - Service with case assignment ("Provide gait training"): = none
    - Service without case assignment: Training received = A + B + D (no C value in this case)
- Certified healthcare professional:
    - Service with case assignment: = B (no C value in this case)
    - Service without case assignment: Training provided = A + D

For nursing services and recording of services for training, coupled production is taken into account when recording services. For situations in which patient treatment and supervision take place simultaneously, the following principle applies: The first person's activity is considered as a service with case assignment (e.g. the operational work), and the other person's activity is considered as teaching or research (Besson, 2013, pp. 261–263).

5.6.2 Services for education and training

The use of coupled services when recording services (cf. Fig. 23, p. 65) is common in education- and training-related service activity, i.e. it often involves LEP services in the "Education and training" service group (cf. Fig. 8, p. 21, Services without case assignment). It is important to note that in an educational context, a distinction can be made between training received vs. provided, and that

- for training received, the training activities and costs are seen and understood from the learner's perspective;
- for training provided, the training activities and costs are seen and understood from the teacher's perspective.

The mentoring service shown in Fig. 23 (p. 65) is a service from the "Education and training" domain. For the healthcare professional, this corresponds to the "training provided" service, and for the student, it corresponds to the "training received" service.

5.6.2.1 Structured and unstructured training/learning environment

LEP services for education and training occur in two different environments. They have a direct influence on the type and intensity of learning and on the associated effort, as well as on the actors involved, i.e. the providers and recipients of a service for education and training.

The two environments can be referred to as structured and unstructured training. A distinction can be useful to simplify the recording of services and to make it possible to analyse the associated costs in a comprehensible way (Besson, 2013, pp. 227–228).

- Structured training covers services that are performed as part of training events like courses or seminars. Examples include the LEP services "Implementing/organising internal continuing training" or "Participating in internal advanced training".
- Unstructured training covers those services that are performed as part of learning during work processes, i.e. in direct conjunction with services "on, for and with patients". Examples include the LEP services "Conducting a learning situation" or "Providing training documentation".

5.7 Services for the identification of procedural disruptions in the treatment process

If the focus is on an analysis for the identification of obstructions and disruptions in the healthcare organisation's work processes, services without case assignment are generally used, especially services and time values relating to professional allowance times from the LEP service group "Setting-/Structure-related efforts". These services represent portions of professionals' work that are required to cover organisational imperfections or to handle personal needs in a healthcare organisation (for more details, see section 2.2.4.5.3, p. 26). A targeted and detailed recording of services and times can be a useful way to collect the necessary analytic data (for the procedure, cf. e.g. section 6.3, "Partitioning based on personnel work hours and costs", on p. 80, or section 8.2, "Separate service and time recording", on p. 103).

5.8 Organisation-specific splitting of LEP services

Organisation-specific splitting of LEP services, e.g. into preparation, performance and follow-up stages, is possible in principle, i.e. the documentation or recording principle can be set aside by the healthcare organisation if desired (see section 2.2.4.3, p. 24).

In this case, it is then possible to proceed according to the "provider and recipient" principle (see section 5.6, p. 62); for example, when recording information for a healthcare professional for the service "Conducting an audit", the desired portion of the split service would be assigned, i.e. each time a

service and time value is recorded, the "Preparation", "Performance" or "Follow-up" portion would be assigned.

Working at this level of detail opens up many analytic possibilities. However, in light of the "exploding volumes" that can be expected to go along with it, i.e. the increased number of items to record and the question of how to clearly separate the parts, it is important to carefully consider what you specifically hope to achieve by splitting LEP services, i.e. what will specifically be analysed and who is expected to derive what kinds of benefits. Alternatives to "recording everything, all the time" include time-limited recording periods or recordings of the split by individual affected parties. For example, perhaps only project managers would record the split parts for "Implementing a project".

5.9 Avoiding cumulative effects with LEP time values

Linking medications in electronic patient documentation with LEP healthcare interventions, e.g. "Administrating medication orally", makes it possible to automate the recording of services, meaning that a healthcare professional does not need to enter redundant data when recording services and times. A possible negative consequence of automation involves undesirable cumulative effects affecting the sum of time values; in other words, adding up time values automatically for each individual service can result in unrealistic total times. At the time when this handbook was written, there was no set of standard and robust time values available that would be valid for all healthcare organisations in connection with cumulative effects. Due to the wide variety of influencing factors within each individual organisation, it is not possible to establish any such standard set of values.

The service "Administering medication orally" from the Medication group, or "Measuring blood pressure" from the Safety group, provide useful examples of possible cumulative effects. "Administering medication orally" is defined as "Administering a dosage form through the mouth into the digestive tract, e.g. tablets, capsules, syrups, drops," with a single administration assigned a default time value of 3 minutes. According to the usual principle, this time includes informing the patient, preparation, checking, administration, observation, follow-up and documentation. The theoretical framework here is the "5 R's rule" or the "6 R's rule"[24]. For example, for 10 tablets administered according to the documentation principle, adding the time values up step-by-step results in 30 minutes of nursing workload (i.e. for ten iterations of the service "Administering medication orally"). An expert group made up of organisations using LEP Nursing 3, software partner companies, and LEP AG has developed a basic model with the most important rules for avoiding inappropriate time values for services in the Medication service group (Fig. 24).

[24] The "five R's" stand for: the right patient, the right medication, the right dosage/concentration, the right application, and the right time. The "six R's" variant adds the right documentation.

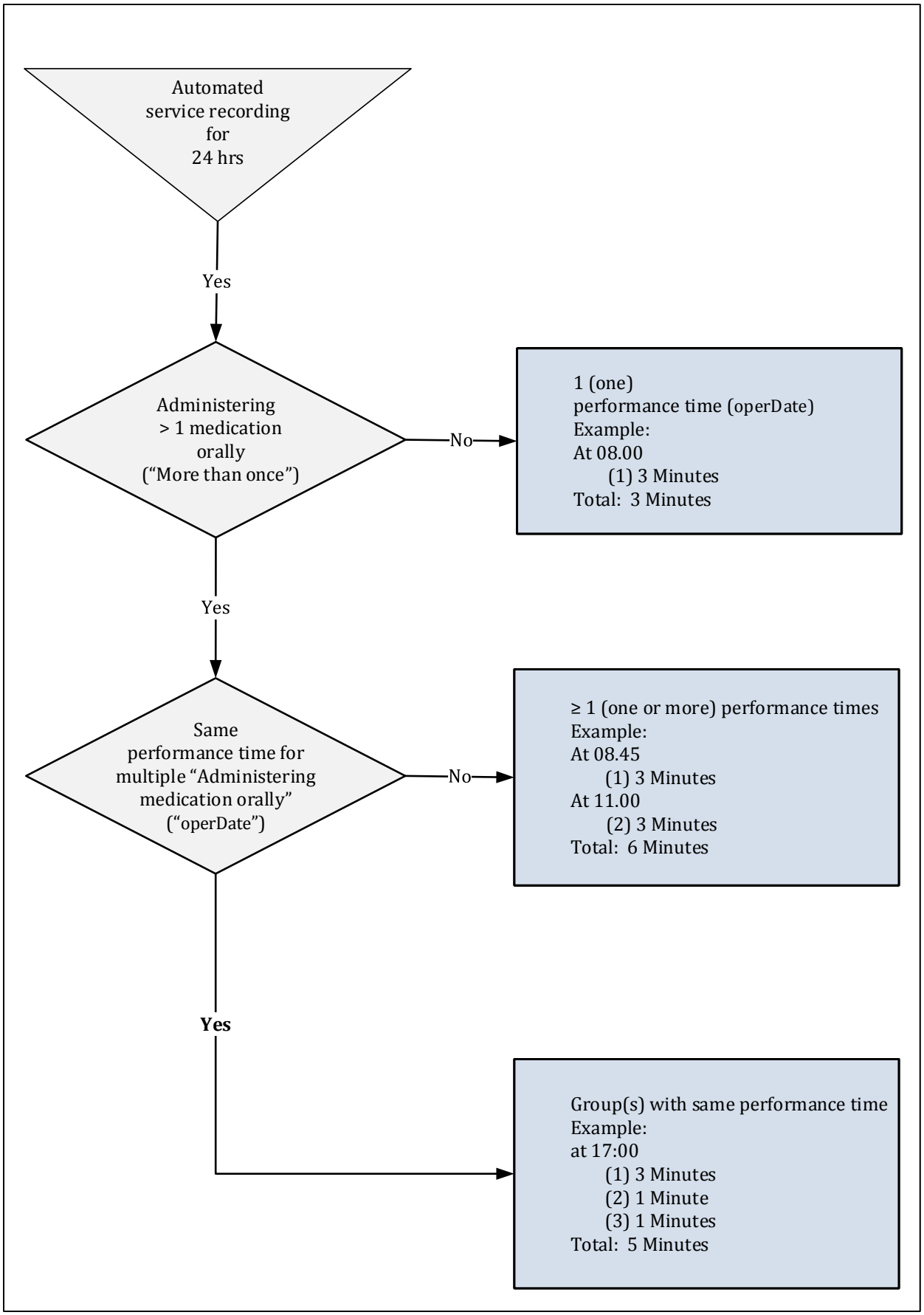


Fig. 24: Accumulation of LEP time values for medication-related services

In Fig. 24 oben, if the intervention “Administering medication orally” is performed more than once in 24 hours, a selection is made based on the rule of the *same* performance time (*operDate*). The performance time is to be distinguished from the planned time (*planDate*) and the documentation time (*docDate*).

If the intervention “Administering medication orally” is *performed* multiple times at the *same* time, these services are grouped together. Within each “simultaneous” group, the model weights the *first* instance of “Administering medication orally” at 3 minutes, the default time value from the LEP classification of services. For each additional iteration of the service, 1 minute is added to the total. In the example in Fig. 24 oben, this method results in a total of 5 minutes of effort for three simultaneous services. An important requirement here is that the *number* of services performed stays exactly as in the model. For more difficult medication services, “Administering medication under special conditions” is also documented or automatically recorded as a service, which is defined as “Preparing/administering a dosage form under difficult conditions, e.g. mortars, cytostatic agents, special support during medication intake and in cases of refusal to take medication, special safety requirements, hazardous substances, discharge/holiday medication, tablet organiser.” The default time value is subject to variation based on different clinical situations.

The recommended method for avoiding cumulative effects with time values depends directly on the work processes and documentation habits of each individual healthcare organisation and its organisational units. For example, in one healthcare organisation, medications might be prepared with machine assistance, but not in another; or medications might be prepared for a 24-hour period in one organisation, or for a single administration (morning, midday, etc.) in another organisation. Cumulative time effects similar to those seen with automatic generation of medication data are also a concern in cases of widespread use of electronically integrated monitoring data (e.g. in an intensive care unit). Similarly to the model in Fig. 24 oben, a rule for simultaneous performance times can be used for a specific set of interventions from the Monitoring subgroup.

As an alternative to the model in Fig. 24 oben, a fixed time value could be assigned to each group for a given number of services, e.g. 5 minutes for 1 to 3 services, 10 minutes for 4 to 9 services. However, the expert group has been unable to approve any of the groupings that have tested. Therefore, the expert group recommends using the model presented in Fig. 24 oben to avoid accumulation of time values.

5.10 LEP for invoicing of services

Invoicing of services is a form of secondary cost allocation that relies on cost-rated quantities. The invoicing or cost rate is established by dividing the cost centre’s costs by a reference value, like LEP minutes or tax points, for example (cf. Table 2, p. 11; Besson, 2013; InEK, 2007, pp. 132–137). Typical analyses for checking and controlling invoicing rates are (Muser, 2007, p. 17):

- Target/actual comparisons
- Costs/services
- Under- and overcoverage
- Internal benchmarking
- Work productivity (available work time/recorded service time)

One sticking point for invoicing of services involves the "rotation positions" often encountered in healthcare organisations, i.e. the services are provided by healthcare professionals in different organisational units or in different departments (cf. Muser, 2007, pp. 6–7). To deal with this, data for the cost centre providing the service ("LErbrKST_key"), among other data, are also defined in LEP alongside the data for the cost centre receiving the service ("LEmpfKST_key") (cf. Table 14, p. 49).

5.11 Data flows in LEP applications

In every LEP reference organisation, existing data should be automatically gathered in the LEP application through interfaces from other modular IT systems (depending on the technical possibilities available in software), e.g. work times should be gathered through a personnel management (PDP) system, or case numbers through an administration system (cf. Fig. 25 unterhalb). If this is not possible, necessary data must be gathered separately (cf. Fig. 29, p. 76).

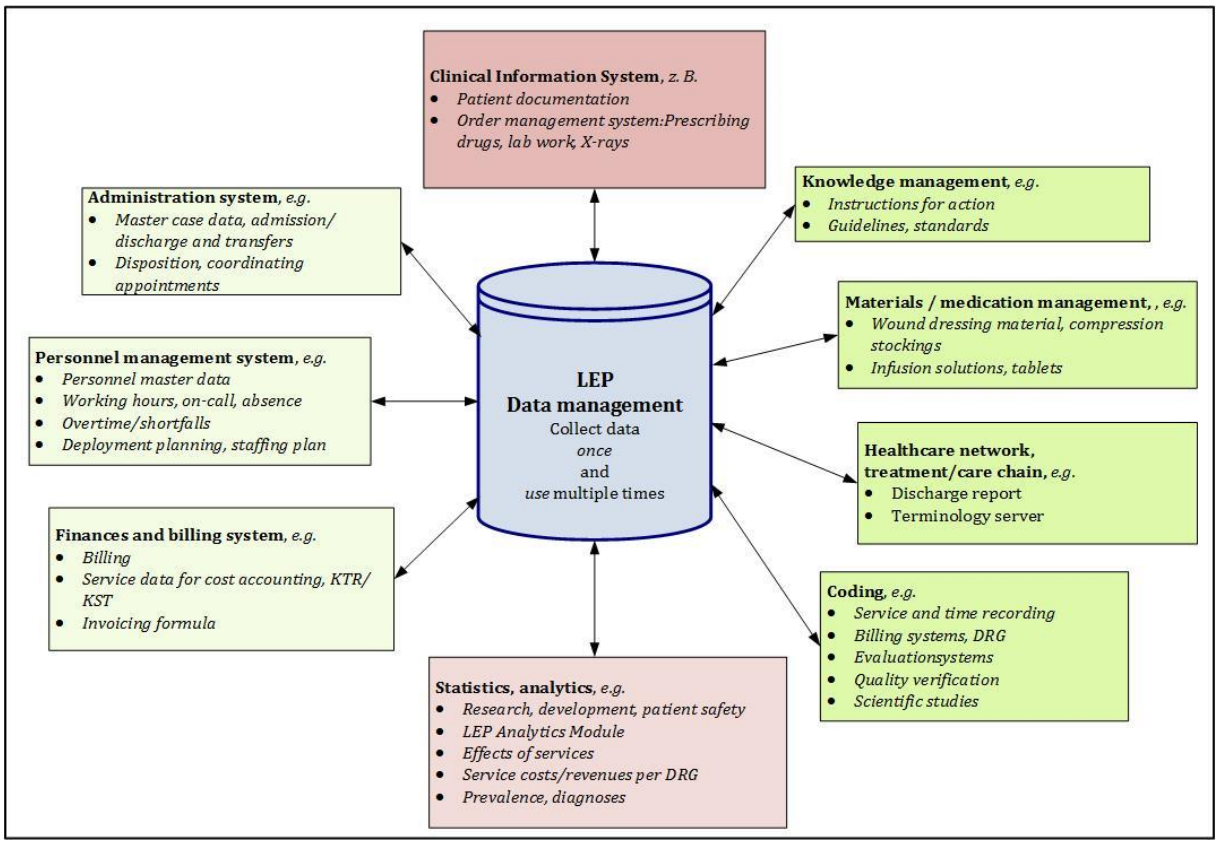


Fig. 25: Data flows for an IT system in LEP applications

It is up to each LEP reference organisation to decide which data need to be imported from or exported to other parts of the system.

The software solution with LEP data can be linked to different outside systems, depending on the healthcare organisation's circumstances and requirements. Relevant datasets in LEP applications that are often available and automatically collectable from outside systems include the following:

(1) healthcare interventions, assessment scores, diagnoses and outcomes from an electronic patient documentation system
(2) master case data such as case number, admission/discharge, type of stay and transfers from an administration system
(3) staff data, work times and absences from a personnel management system

(cf. Fig. 25 oben).

In other words: The data flow for the LEP analytics module may begin as early as the moment when interventions or diagnoses are entered into the electronic patient documentation.

With an approach to data management that emphasis secondary and multiple uses of data, we avoid collecting redundant data (in this case, analyses with LEP) for an "insatiable bureaucracy" (Schulz, 2011, p. 27), thanks to a clever approach to collecting data in the IT system, but also thanks to the structuring of the LEP classification of services into different levels of aggregation (see section 1.1, p. 1).

The "clinically oriented" perspective of the healthcare professionals at the *point of care* considers it important that service data can be collected in a way that is integrated into the IT system, and that is therefore automated. Data collection efforts for analytics with LEP are kept to a minimum by the fact that the services already documented by healthcare professionals at a low level of aggregation (i.e. a high level of detail) in the IT system, particularly in patient documentation, do not need to be recorded again by healthcare professionals at a higher level of aggregation for secondary use (for levels of aggregation, cf. Fig. 8, p. 21). To avoid double recording in general, healthcare professionals should only have to *manually record* those additional data that are *missing for the analysis* (cf. Fig. 32, p. 85).

5.12 Software requirements specification for software implementations of LEP

LEP is not a software application. Putting LEP into practice requires the development of an appropriate software system that is convenient to use. With an eye toward the goals set for analytics, nursing care documentation and the recording of services and times, the challenge is to develop a software implementation of the LEP application that provides user-friendly support for all stages of the treatment process and the support and management processes, while minimising documentation and recording efforts (Ammenwerth et al., 2003 a, p. 14).

A high priority for any software implementation of LEP is that it be user-friendly. For example, allowing users to add extra detail to interventions makes a significant contribution to the user-friendliness of working with LEP Nursing 3 in patient documentation, e.g. when planning the intervention

"Administering a liquid", additional details like "orange blossom tea with a half-lump of sugar" can be added if desired by the healthcare organisation and the individual user (see Fig. 26).

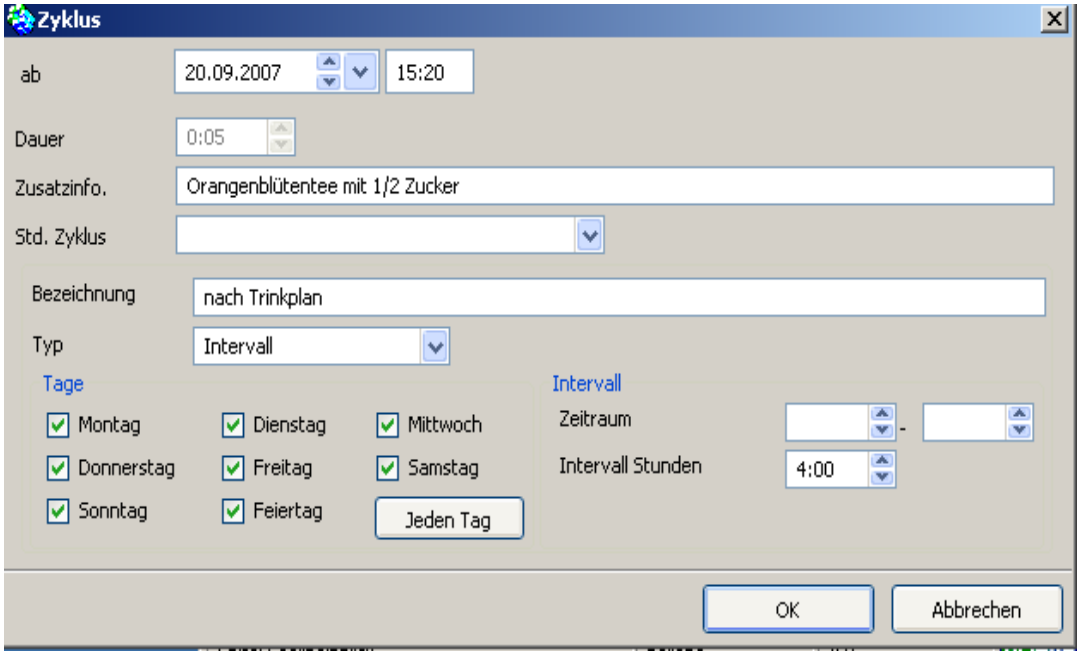


Fig. 26: Example specification criterion: Ability to add extra details for interventions

In the example above, the healthcare professional reading the patient documentation can see exactly what kind of liquid they should administer to a patient as part of the treatment process. These added details provide a sense of "individuality" than can contribute significantly to personalised and situationally appropriate treatment and nursing care. To support the use of further details, it should be possible to add "sub-catalogues" (subsets) or text templates. For the intervention "Providing gait training", for example, a catalogue could be expanded with assistive devices like "walking frames" or "canes".

To address such points, specification criteria for the software requirements specification are defined in a specially prepared document which makes a distinction between mandatory and optional criteria. The mandatory criteria define the minimum standards for the implementation of LEP in a software application. Mandatory criteria standardise and harmonise the ways in which LEP is implemented in software, and establish comparability and a common data foundation (cf. section 4.1, p. 44).

For detailed analyses of treatment quality, the LEP software handbook also specifies the requirement that the software must (for example) allow several distinct time values to be entered for an LEP healthcare intervention (Table 20).

LEP intervention	Planned time	planDate
	Performance time	operDate
	Documentation time	docDate

Table 20: Three time values for detailed LEP analyses

Specification criteria are defined for the implementation of LEP classifications, partner classifications, instruments and standards, as well as their links and mappings to one another.

Depending on how LEP is integrated into an IT system, links to other modular IT systems may need to be set up for an LEP application, e.g. links between patient documentation and statistical analyses, but also to the personnel management or administration system (cf, Fig. 25, p. 71). Specific interface definitions are provided in the LEP software handbook to assist software partners with this aspect of implementation. Required elements include the calendar date, the person or cost centre providing the service and the one receiving the service, the case number, and the party commissioning the task.

Operationalised specification criteria allow for a critical review of the software's suitability as a technical tool for putting LEP into practice and supporting healthcare professionals in the treatment process. It is recommended in the literature that it should be clearly defined how many specification criteria, and which ones, the software needs to satisfy in the form of mandatory criteria vs. optional criteria (e.g. Ammenwerth, 2003). As a general principle, user-friendly documentation of the treatment process requires that the individual stages of the process be linked to one another. The central requirement here is that diagnosis, treatment goal and intervention must be linked. If a software application is able to provide optimal support for LEP users and work flows, then it fits with the healthcare organisation's circumstances and satisfies the specification criteria for a software implementation of LEP. "Customised software implementations of LEP" is not just a buzzword, it's a reality. The goal is for LEP to be able to handle the tasks specified by the healthcare organisation, and for the people who have to complete those tasks to be supported in their use of LEP. A software implementation of LEP that is logically aligned with an organisation's professional needs is an essential requirement for the successful use of LEP for statistical analyses, patient documentation, and the recording of services and times within a healthcare organisation.

6 Using analytics with LEP

Once a healthcare organisation has decided which tasks the LEP application should handle, a relevant next step is to select the analyses to be supported and to determine which data they will require (cf. Fig. 6, p. 17). The LEP classification of services allows for consistent analyses of services. LEP analytics can be used for all work processes carried out by healthcare professionals (services with and without case assignment, allowance times), e.g. for major questions like the following:

- Which services are healthcare personnel, e.g. midwives or registered nurses, providing directly to or with patients? (services with case assignment, direct LEP interventions)

- How many services do the healthcare personal provide directly to or with patients?
- How much time do the healthcare personal require to provide services directly to or with patients?
- Which services are healthcare personnel, e.g. occupational therapists or nutritionists, providing indirectly for patients? (services with case assignment, indirect LEP interventions)
- How much time do the healthcare personal require to provide services for secondary processes? (services without case assignment)

Services can also be analysed in relation to specific parameters defined by the healthcare organisation, e.g. for invoicing of services in internal or external projects. Various types of invoicing are supported based on time spent, service type, fixed rates or the party commissioning the task. It is necessary to determine which analyses are needed in order to complete the required tasks, and which LEP data (and how much) have to be collected in support of those analyses (Fig. 27). Based on the service analyses and documentation directed by the healthcare organisation, indicators for efficient operational control can be leveraged in targeted and innovative ways.

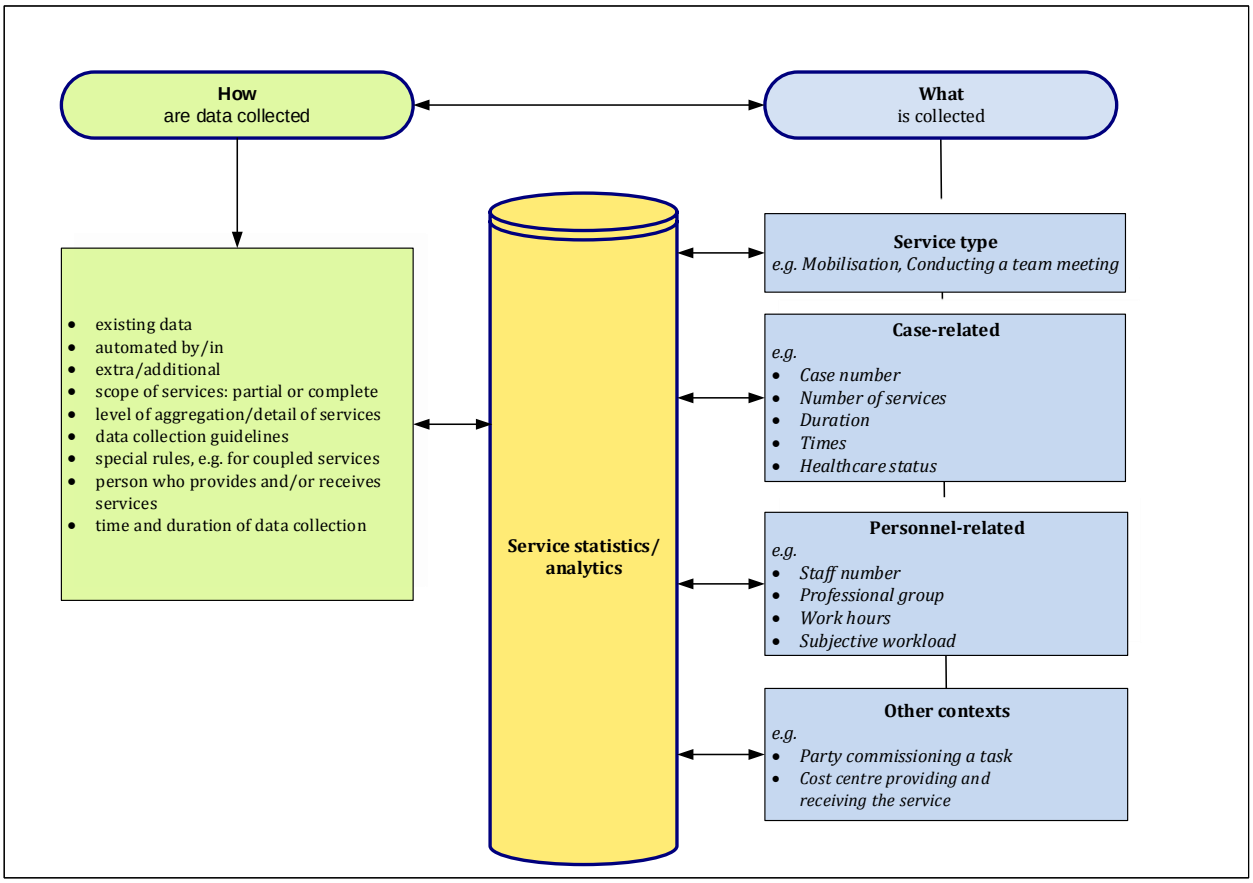


Fig. 27: "Which data are collected and how" for LEP analytics

This simplified overview clarifies the connections between analytics, the necessary data, and the data collection process. It is important to always keep the hardware and software in mind here as well, along with their functionality and performance characteristics, as these can have a significant impact on data availability and the ways in which data can be processed.

Which data are needed depends on the analyses that a healthcare organisation wants to conduct (see Fig. 28 unterhalb). This is explained in a relatively linear way in the following paragraphs, but as an operational reality, it is better understood as an *iterative* process: A healthcare organisation gradually approaches the "right" analyses, the necessary data and appropriate data collection procedures in a step-by-step process of repeated decision-making procedures.

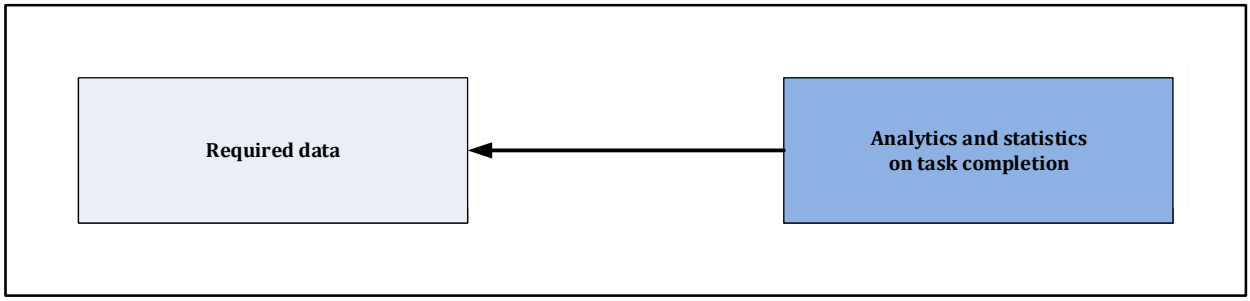


Fig. 28: Data required for desired analyses

When deciding which data to collect, the answer to the question, "Which analyses does the healthcare organisation want to use in a targeted way to help complete its tasks?" should serve as an essential guideline (cf. Fig. 25, p. 71). Directly related to the relevance of the required data for analyses is a reasonable level of data collection effort. It is important to avoid going "overboard" with documentation and recording. If the analyses are expected to provide a major benefit, that may justify a higher level of data collection effort. If data to be collected for analyses are already available for other purposes within the organisation, the data collection effort for these data with regard to LEP analytics is no longer a significant issue. For example, personnel times or patient identification numbers can be automatically extracted from the organisation's own administration system (Fig. 29).

Fig. 29: Automated and additional data collection for analytics

Therefore, it is essential to examine which parts of the necessary data can be routinely documented and automatically collected, and which data will need to be specially collected for an analysis and require an additional reasonable level of effort (cf. Fig. 29 oben).

All LEP data required for the analyses that a healthcare organisation wants to conduct can be listed out for evaluation and selection purposes. In preparing this list, it can be helpful to distinguish between

(1) routine clinical data that are automatically available from electronic patient documentation with no additional effort, e.g. direct LEP interventions (cf. Fig. 9, p. 23) like "Performing lateral positioning", "Measuring blood pressure", or the ICD diagnosis "Spastic hemiparesis and hemiplegia";
(2) routine administrative data that are available with no additional effort, e.g. the case identification number, personnel work time, or absences (compare with the data from the LEP secondary classifications, p. 31); and
(3) data that must be recorded especially for the purposes of a particular analysis and therefore require additional collection effort, e.g. indirect LEP interventions (see section 2.2.4.2, p. 23) like

"Maintaining patient documentation" or "Organising patient appointment" or LEP services without case assignment (see section 2.2.4, p. 22) like "Maintaining workplace" or "Guiding/instructing employee".

The concrete basis for listing and selecting the data that the healthcare organisation requires for its analyses is provided by the LEP standard export data for analytics and the variable definitions provided for each LEP standard assessment. They are available to all software partners and LEP reference organisations (see the examples provided in Table 14 on p. 49, in Table 15 on p. 50, or in Table 21 unterhalb).

Number	Variable / data field	
32	LErbrKST_key	
39	**LErbrOE_key**	
41	LEmpfOE_key	
116	**LEPEinzelleistung_key**	
119	LEPMinIst	
	Example definitions	
41	Field name (short): Field name (long): Definition:	**LEmpfOE_key** Organisational unit ID – service recipient The identification number of the organisational unit in which the service is being provided, or in which (for example) a patient or student receives the service, e.g. Ost. 1, Medicine 2 (location and/or specialisation-based perspective).
116	Field name (short): Field name (long): Definition:	**LEPEinzelleistung_key** Individual service ID as per LEP The identification number of an individual LEP service/intervention at LEP aggregation level 4.

Table 21: Example of variables and data for selection for LEP analytics

Wherever possible, the final selection of data for analyses on site should take all potential user interests into account (quality of treatment, patient safety, controlling, finances, management and support).

6.1 Avoiding additional collection effort with weighting

Wherever possible, healthcare professionals should *not* be required to perform any *services that have no productive value for cases*, or only those that are indispensable for the management of their healthcare organisation. For analyses with LEP, additional collection effort is avoided by using quantitative weighting to account for data that are not collected separately, or by using allocation keys (automatic addition of time values) to incorporate them into calculations (see Fig. 30).

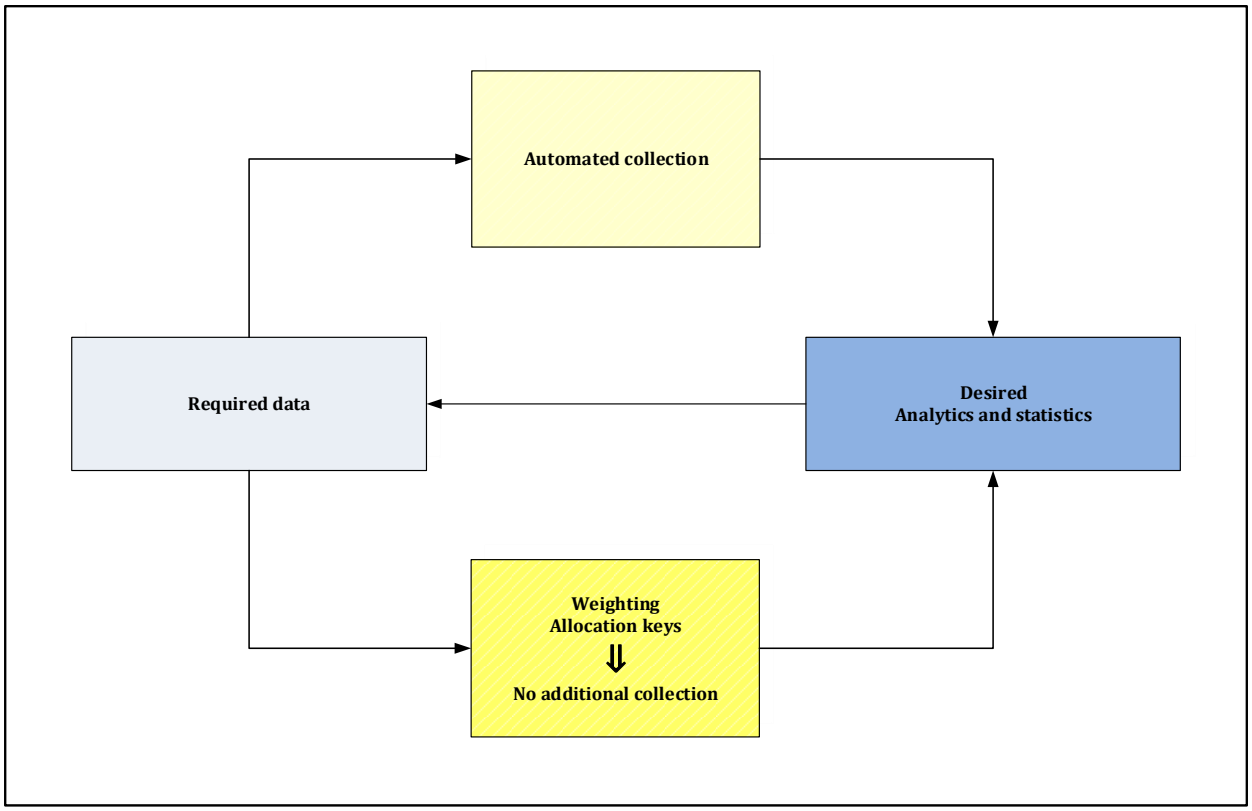


Fig. 30: Avoiding additional effort through weighting and allocation keys

Weighting and allocation keys in the form of automatic addition of time values offer efficient ways to avoid unnecessary additional data collection effort, especially for analyses oriented toward financing ("invoicing formulas") or personnel time (see section 6.3, p. 80).

For example, a healthcare organisation could set the weighting for indirect LEP services and services *without* case assignment, in the form of "fixed services" (routine services), to an added time value of 20% in *relation* to personnel time. These proportions can be reviewed on the basis of *periodic* measurements and modified as needed, e.g. by recording "Materials management" values for a one-month period twice a year (see section 6.2, p. 79).

With regard to the core process, however, it is recommended that organisations focus on weighting data that are collected automatically and with no additional effort. For example, a healthcare organisation could set the weighting for recorded services at a value of 70% in *relation* to personnel time (cf. section 6.4, p. 82). This kind of approach to weighting motivates healthcare professionals much more effectively, since they prefer to work "on, with or for" patients and not for (what they see as) administrative purposes (cf. Schulz, 2011, p. 27). These proportions can also be directly reviewed, thanks to direct documentation. In addition, this proportion can easily be communicated to healthcare professionals, and internal communication among staff on this point is straightforward.

Individual healthcare organisations will have a diverse range of different initial situations and organisation-specific procedures. Even so, it is important to note for all organisations that the hardware

and software available on site, and the associated functionalities, can have a decisive influence on the amount of additional data collection effort.

6.2 Partitioning the data needed for analytics

To minimise and differentiate the data collection effort for the analytics data identified for additional collection by the healthcare organisation, it is helpful to partition (separate) all the data needed for LEP analytics based on the LEP standard export data and the associated variable definitions (cf. Table 21, p. 77). The partitioning process involves separating the data to be collected for analytics into data or service domains of a specified size and location. The partitioned (separated) data can then be collected for the corresponding LEP analyses, independently of one another and in different ways (cf. Fig. 29, p. 76). For example, a partitioning of data like the following would make it possible to collect different types of data in different ways:

- in the data domain for "Services with case assignment",
  - direct LEP interventions (cf. Fig. 8, p. 21, and Fig. 9, p. 23) are classified individually at the 4th aggregation level,
  - indirect LEP interventions are combined or bundled at the 4th aggregation level into so-called service bundles or complexes (see section 7.3.3, p. 93);
- in the data domain for "Services without case assignment",
  - services for "Education and training" and "Development" are grouped together in a generalised way at the 2nd aggregation level,
  - all remaining services without case assignment are not partitioned or not recorded, and are incorporated into the calculations for the analysis by means of weighting and allocation keys (cf. Fig. 30, p. 78).

To take another example, a partitioning of data based on time, like the following, would make it possible to collect different types of data independently:

- in the data domain for "Services with case assignment",
  - individual direct LEP interventions (cf. Fig. 8, p. 21, and Fig. 9, p. 23) are continuously recorded at the 4th aggregation level,
  - individual indirect LEP interventions are recorded at the 4th aggregation level twice a year for a period of one month;

- in the data domain for “Services without case assignment”,
  - individual LEP services from the service groups for “Education and training” and “Development” are recorded continuously and in detail at the 4th aggregation level by in-service teachers and occupational trainers, but only at the 2nd aggregation level (though still continuously) by other healthcare professionals.
  - all remaining LEP services (e.g. “Materials management” or “Research”) are recorded at the 2nd aggregation level twice a year for a period of one month.

As a general point, it is clear from the examples above that LEP allows for both full and partial analyses of services at different levels of aggregation for different core tasks (cf, Fig. 1, p. 3), and that the data can be collected in a targeted way to achieve a level of collection effort in line with the requirements of a given analysis.

6.3 Partitioning based on personnel work hours and costs

Personnel work hours are a “classic” example of a reference variable in an analysis of services. Our next example will therefore look at partitioning data based on personnel work hours.

Personnel work hours, or *net work hours*, represent the period of time from the start of work to the end of work during which a healthcare professional is actually available to provide services – excluding break times and paid absences provided for in the employment contract (“net service period”). For example, if work started at 8:00 on a given day and ended at 16:30, and assuming a 45-minute break, the net work hours for that day would be 7 hours and 45 minutes. It is important to include any overtime or shortfalls in the calculation. The net work hours for a staff member, e.g. for a healthcare professional, is often compared with the time spent on services with and without case assignment (see Fig. 31 unterhalb; cf. Frodl, 2011, p. 67; Ganz, 2014; Naegler, 2015; Wabro, Matousek & Aistleithner, 2010, VII; Wipp, Sausen & Lorscheider, 2012, p. 10).

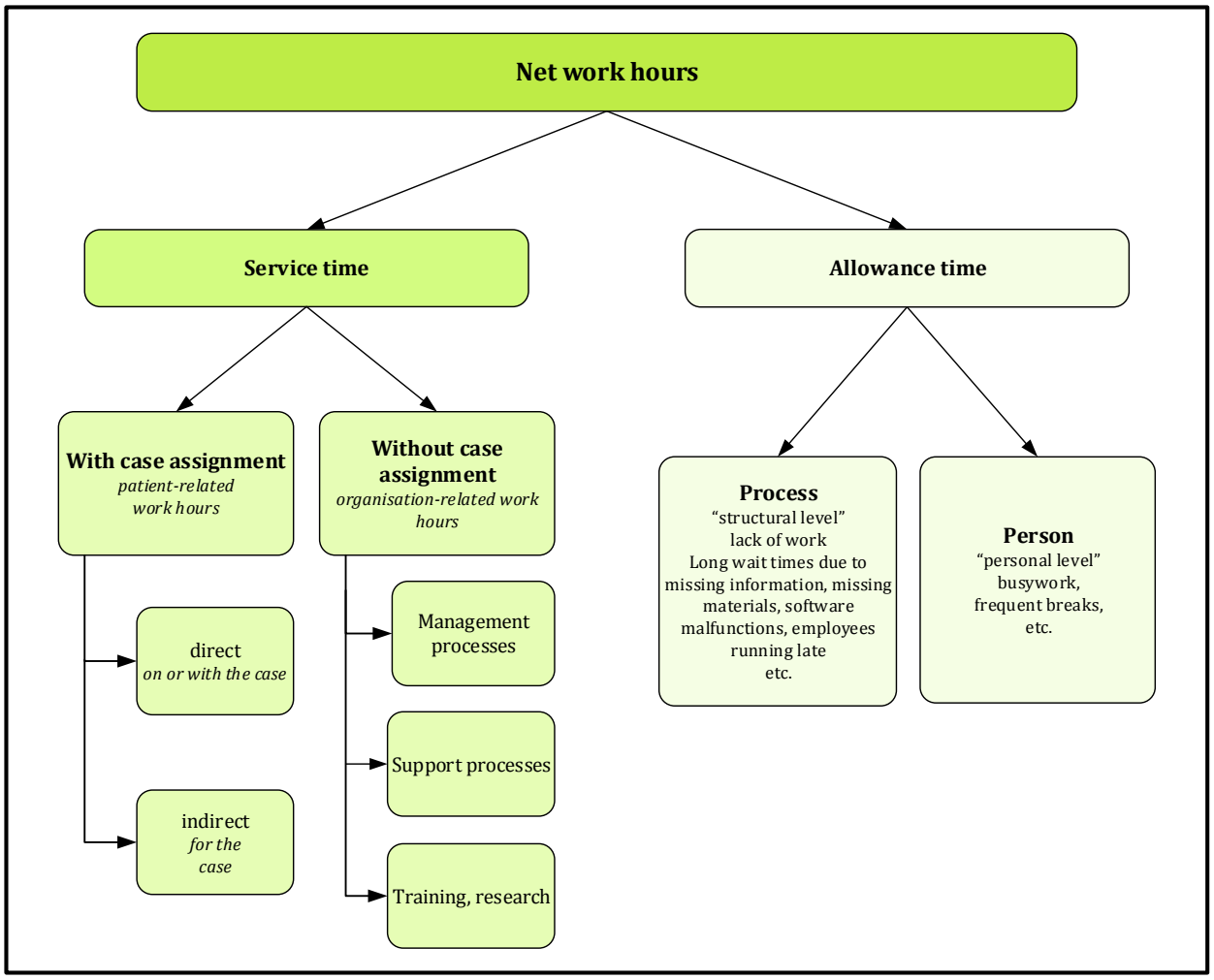


Fig. 31: Organisation of net work hours

When selecting the required data, it is important to keep in mind that not only services *with* case assignment, but also services *without* case assignment, can be fully recorded with LEP. Documented services "on, with or for patients" can be automatically generated for analyses.

For analyses with work hours as a target variable, users are faced with the question of whether the LEP service time should be expected to "fully" align with work hours *without* using weighting methods or allocation keys (automatic addition of time values), e.g. with the service effort spent on education and training, materials management or personnel management. These services must then be recorded separately outside of patient documentation – with as little time and effort as possible. The core question that the organisation then asks itself to determine the data needed for an analysis with regard to work hours (cf. Fig. 31 oben) is the following: Should *all* services that healthcare professionals perform in an organisation, including the time needed to perform them, be expected to align with work hours (see section 2.2.4.5.3, p. 26)?

LEP imposes no guidelines that would require services to be fully recorded for analyses with work hours as a variable. As a rule, healthcare professionals do not consider it useful or efficient to collect additional data that they see as administrative in nature for the sake of an "insatiable bureaucracy",

especially since this can have a negative effect not only on staff satisfaction, but also on the quality of the data collected (Schulz, 2011, p. 27; see 1.6, p. 10).

In order to keep data recording effort to a minimum, weighting and allocation keys (see section 6.1, p. 77) are generally a robust and widely-accepted alternative to full recording of services as a way of fully covering work hours and the associated personnel costs.

For example, a healthcare organisation might only systematically record those services for use in analytics that are clinically relevant and can be generated from electronic patient documentation with an automated approach to recording services. While the healthcare professionals preparing the documentation are aware that (automated) recording of services is taking place "in the background" (see section 5.4, p. 59), they do not manually record any services themselves. The remaining services with case assignment (e.g. "Maintaining patient documentation") and services without case assignment are allocated by means of an allocation key (Oertle & Baumgartner, 2010).

As mentioned earlier in section 6.1, p. 77, and in section 6.2 on p. 79, the approach that has proven successful involves *selective* recording of one or more service groups, e.g. the "Education and training" or "Development" service groups (project and quality management). For robust allocation keys, *specified threshold values* or target values are helpful. In the above example for personnel allowance times per employee, the threshold value is 5% of net work hours. If all services with case assignment are recorded, then depending on each organisation's circumstances, 70% of productive patient-related work time (cf. Fig. 31, p. 81) can serve as an appropriate target value, i.e. the time values for services with case assignment represent a proportion of 70% in relation to the net work hours (see section 6.1, p. 77).

To establish robust threshold values, full recording of services can be implemented on a limited-time basis (e.g. for one month) for particular data domains, e.g. for productive work hours without case assignment (cf. Fig. 31, p. 81). This can be repeated if major changes occur in an organisation's operating procedures. Other organisations may instead opt for a complete alignment of personnel work hours with service times (cf. Fig. 31, p. 81), i.e. continuous recording of all services.

6.4 Determining case-oriented standard productivity with LEP

For operational management purposes, it is recommended that organisations work with LEP analytics to determine a case-oriented *standard productivity* value (for the term "productivity", see also section 4.2, p. 45). Standard productivity represents the ratio of the time spent on services with case assignment to the resources used for each unit of time. Example: If the time spent on services with case assignment is 6 hours and the net work hours are 8 hours, the standard productivity value is 75% (Table 22).

Time for services with case assignment	/	Net work hours	=	Standard productivity

Table 22: Case-oriented standard productivity

The results of such analyses with LEP can often cause considerable surprise in healthcare organisations, leading to activities aimed at increasing employees' case-oriented standard productivity and checking the impact on operating income (cf. Table 2, p. 11).

If the "unproductive" time is added to the time spent on services with case assignment, the result is the net work hours, or a "base productivity" value (see example in Table 23).

Time for services with case assignment	+	Time for services without case assignment	+	Time for work disruptions	=	Net work hours

Table 23: Case-oriented standard and base productivity

Expressed in figures, the relations in Table 23 might look something like this: 6 hours for services with case assignment + (plus) 1.75 hours for services without case assignment + (plus) 0.25 hours for work disruptions (cf. section 2.2.4.5.3, "Professional and personal allowance times", on p. 26) = (equals) 8 hours net work time.

When comparing organisations, productivity corrections in the form of minutes or percentages are appropriate if more time is needed for certain services, e.g. due to long distances
or larger administrative effort. A methodologically case-oriented approach to productivity, i.e. setting a target value of 75% standard productivity as in the above example, is more motivating for healthcare professionals, because they prefer to work with, on or for patients "at the bedside". From this perspective, there is a tendency to want to reduce the time spend on services that are "unproductive" for patient cases. If the targets are set "the other way around", however, e.g. with a requirement like "office time may not exceed 25%" for the above example, this may be experienced as less motivating and more bureaucratic (cf. Schulz, 2011, p. 27).

Going further with the methodological approach under which a target time value should be provided for case-oriented standard productivity, it quickly becomes clear that this approach can also be applied to the type and number of services, and that organisations can move progressively closer to fixed services, service bundles or clinical treatment pathways (see section 7.3, p. 88, through 7.3.3, p. 93). Another direction points toward the establishment of specific productivity rates in relation to particularly time-consuming services.

The decisive factor for the reliability of LEP service-time analyses with regard to work hours is that they must be recorded correctly, i.e. work hours must be recorded correctly with overtime and shortfalls, holidays, flex time or absences. Failure to do so will result in systematic distortions in the analyses.

6.5 No multiple collection, no redundant data

To keep the effort spent on additional collection of required data to a minimum, another relevant factor besides partitioning is avoiding any "double recording" of (redundant) data.

Redundant data are facts that are already documented in an IT system and that are represented multiple times after repeated data collection, where that repetition is assessed as inefficient. Such data should be identified and deleted.[25] Redundant data can be discarded without any loss of information. The consequences of redundant data are inefficiency resulting from repeated effort and a lack of consistency in the data, e.g. mismatches between documented data and additional data entered as part of a separate recording of services. In this case, redundancy is created e,g, when healthcare professionals document "Administering a liquid" with LEP, and simultaneously record "Nutrition" with LEP in a separate recording of times and services relating to work hours (cf. section 8.2, p. 103). Or, for example, when a BP value ("120/90") is entered in the chart and "Measuring vital signs" has also been separately recorded for the recording of times and services. Automated data recording is of great importance in avoiding double recording of data (Fig. 32).

[25] Deduplication: Identifying and removing redundant information items.

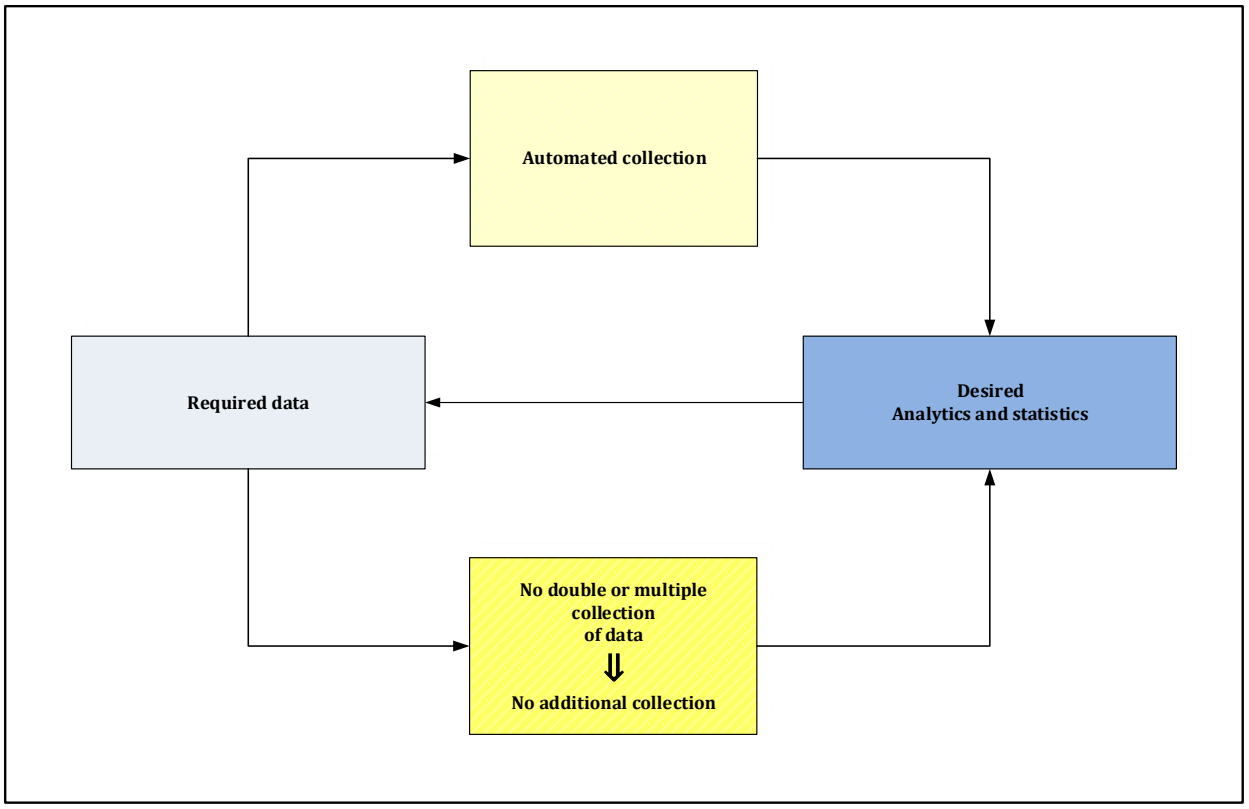


Fig. 32: Reducing data entry effort by avoiding double recording

One simple and obvious way to avoid redundant data is to avoid documenting the same situation twice. Thanks to the automation and aggregation options available with today's technology, situations that have already been documented in detail in an IT system do not need to be additionally (re-)recorded at a higher level of aggregations. For "Administering a liquid", for example, there is no need to separately record "Eating/drinking" or "Nutrition" (cf. aggregation levels in Fig. 8, p. 21).

Prescription-writing can also often be seen as a form of double recording. Part of the issue here is that prescriptions from the doctor to the nurse, e.g. for medication or rinses, must be copied over from free text into structured data.

7 Patient documentation with LEP

Besides determining the data needed for analyses, clarifying the structures needed for patient documentation, along with documentation requirements, is a high priority when deciding which tasks should be handled through the use of LEP (cf. Fig. 6, p. 17).

One central task that should be handled through the use of LEP in patient documentation is reflected in the motto "Collect once, use many times" (see section 5.1, p. 57). Accordingly, data are made available to assist healthcare professionals in the treatment process. Therefore, patient documentation should be prepared in a targeted way: If the LEP data that come from it can be used multiple times and in a variety of ways, the amount of documentation effort over the healthcare organisation as a whole will go down.

7.1 Perspectives and cooperation in the treatment process

For the various stages in the treatment process (see section 3.2, p. 37), a distinction can be made (simplifying somewhat) between differently-oriented perspectives. These perspectives can focus primarily on a physical, psychological or educational/nursing-based treatment of the patient's health status (Ammenwerth, 2003, p. 184). The spread of technical and general diagnostic and therapeutic possibilities in the healthcare domain has led to increasing specialisation and division of labour among the occupational groups involved in the treatment process. Against this background, an often-voiced concern with regard to the treatment process is that the treatment and care of patients is too highly specialised by occupational group and too heavily focused on operations, and that the division of labour is too rigid (Ammenwerth, 2003, p. 172). In reaction to this, there is a growing demand for increased multi-professional cooperation in the treatment process that also has an influence on patient documentation (see Fig. 33 unterhalb).

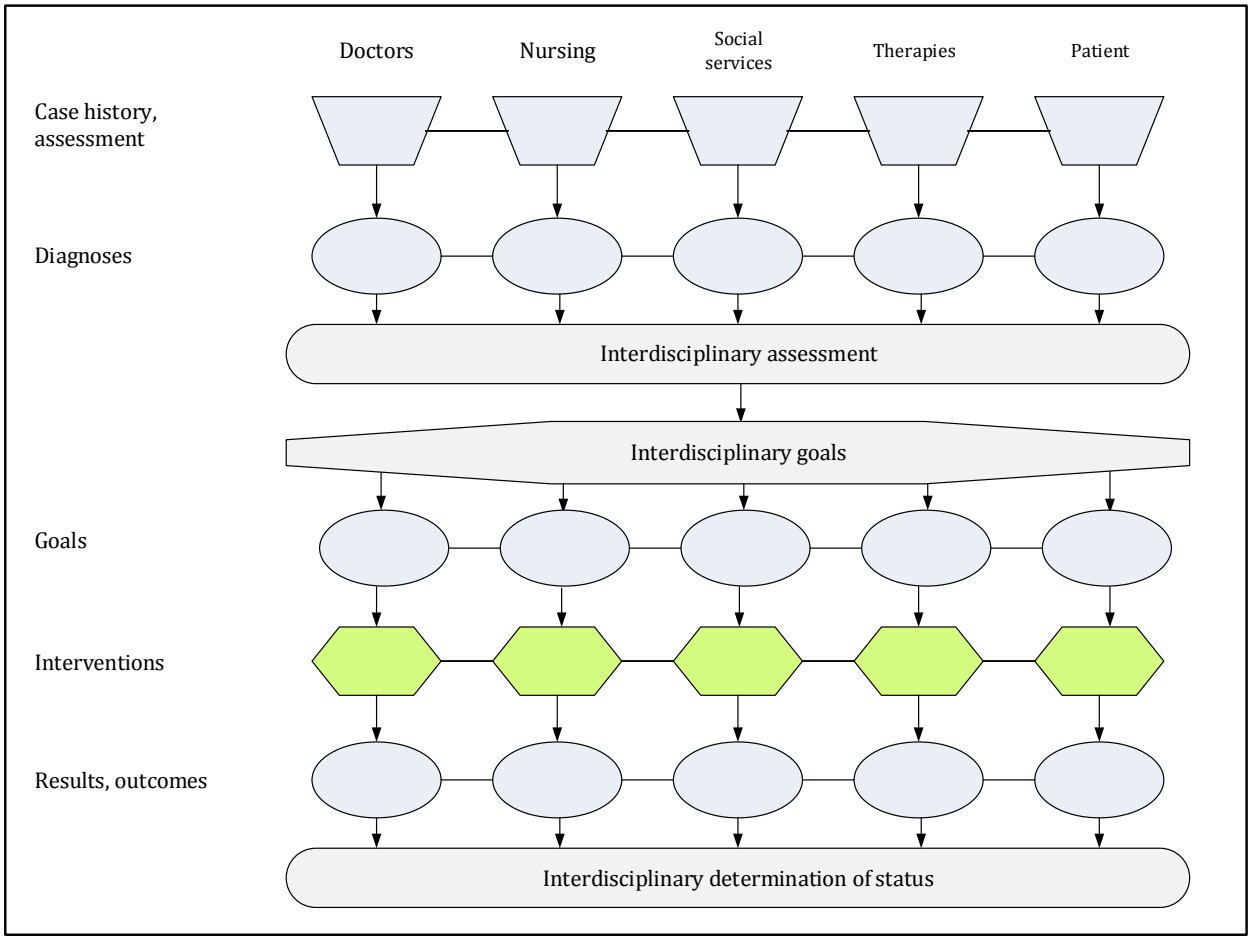


Fig. 33: Treatment process, cooperation and patient documentation (adapted from Abderhalden, 2006)

In the treatment process, patient outcomes and patient benefits are the first priority (Bürki et al, 2010, p. 24). They are the basis for the service processes used by different occupational groups. Healthcare professionals record services and patient outcomes in the patient documentation. They cooperate with each other within their own occupational groups, and between occupational groups throughout the entire treatment process (Fig. 33; cf. Fig. 13, p. 38). Alongside cooperation *within* a

healthcare organisation, cooperation *across organisations* is also of central importance (see section 1.1, p. 1). The importance of cooperation for the quality of treatment is also emphasised in eHealth contexts.

When using LEP, various data are exported from patient documentation for purposes of analysis, including data about health statuses (assessment, diagnoses, goal, outcomes) and healthcare interventions (cf. Fig. 25, p. 71). Depending on the questions being asked and the corresponding analyses, these data are combined with each other and with other data, e.g. data about occupational groups and cooperation.

With regard to patient outcomes, analyses of a healthcare organisation's LEP data can be used e.g. to review or provide clinical justification for the planning and performance of healthcare interventions in connection with assessments. We can analyse the effectiveness of completed interventions in connection with goals and outcomes, or we can analyse which interventions are performed by which occupational groups with which outcomes.

7.2 Goals of patient documentation with LEP

Documentation of the treatment process is known as patient documentation. It contains a comprehensive description of diagnosis and treatment as a planned service, performed and reviewed in a systematic and goal-oriented manner by healthcare professionals.

When a healthcare organisation uses LEP components to assemble a solution for patient documentation, or for patient documentation with integrated recording of services, that it and other actors in its environment consider to be optimal, it is essential to recall that patient documentation must be seen as independent of how services are recorded. Patient documentation is intended to support the treatment process, and must not become bloated through the recording of clinically irrelevant or personal data (see section 8.1, p. 101).

When establishing patient documentation and the associated documentation requirements, the following goals can serve as helpful guidelines. The goal of using LEP in patient documentation is to support optimal patient outcomes by ensuring that the use of LEP

- has a positive effect on clinical practice and cooperation between healthcare professionals in the treatment process;
- results in an efficient distribution of resources in accordance with actual patient needs (assessments, diagnoses, goals);
- optimises treatment flows in a patient-oriented and cross-occupational way;
- relieves healthcare professionals of the burden of double/multiple recording and prevents the recording of redundant data (see section 5.1, p. 57);
- provides healthcare professionals with knowledge about the healthcare interventions to be performed, directly in the patient documentation (see section3.5, p. 41)

(Fagerström, Lonning & Andersen, 2014, p. 33; Fitterer et al., 2009, pp. 38–39; Urquhart, Currell, Grant & Hardier, 2009).

Data automatically extracted from patient documentation should be considered as routine clinical data for secondary usage, i.e. as a kind of welcome *recycled product* for analyses and statistics (Hackl et al., 2016).

The question is, which documentation components are needed to complete tasks, and what volume of data needs to be documented and in what amount of detail.

7.3 Structure of patient documentation with LEP

The fundamental structure of patient documentation is based on the two core stages of the treatment process: diagnosis and treatment (see 3.2, p. 37). For process documentation specific to individual occupational groups, a more fine-grained structuring into assessment, diagnosis, goal, intervention and outcome can be useful, with the "Intervention" structural element being further subdivided into planning ("target") and performance ("actual") (cf. Fig. 13, p. 38 and Fig. 33, p. 86). Patient documentation guides occupation-group-specific cooperation, e.g. in the midwifery or nursing care process, and provides other occupational groups with information at a sufficient level of clinical detail when needed. Documentation of occupation-group-specific treatment processes is the first main element for the structuring of patient documentation (cf. Fig. 34 unterhalb). Examples include documentation of the midwifery and nursing care process and the medical case history.

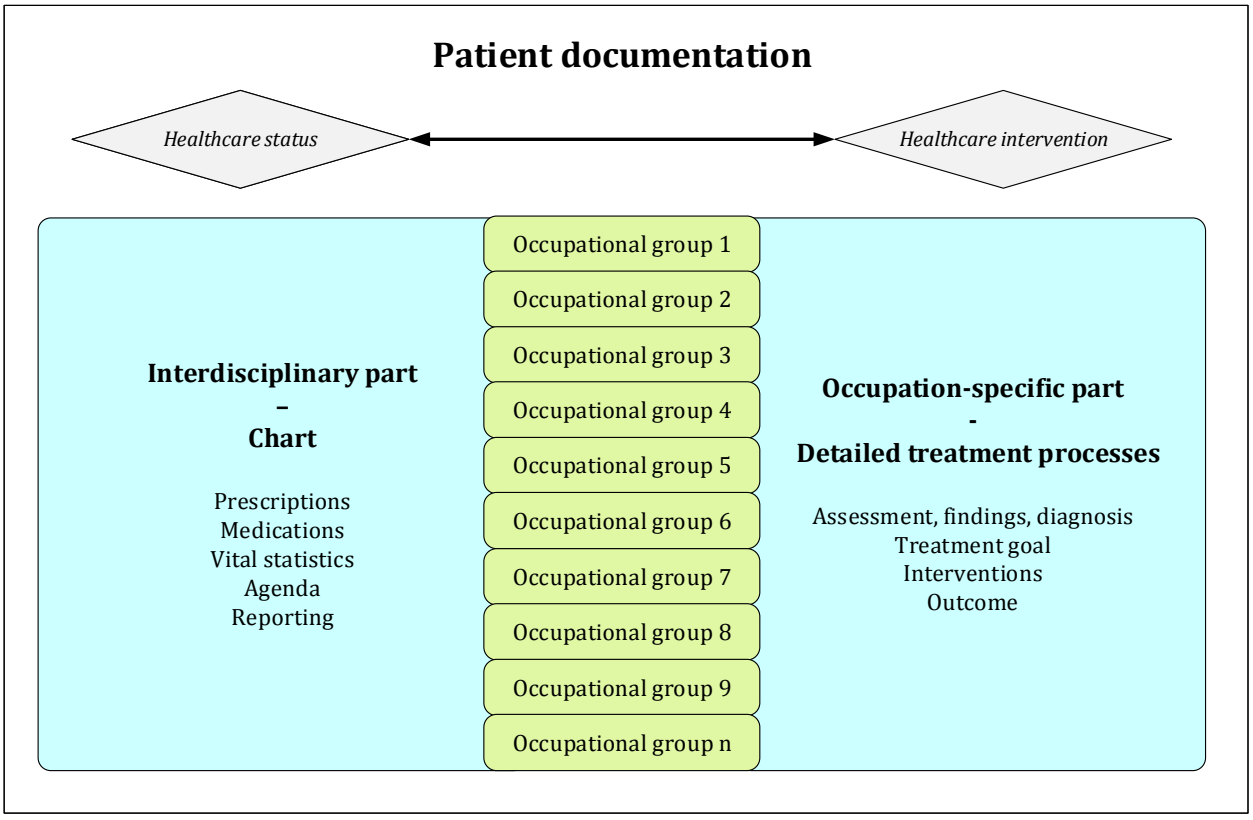


Fig. 34: Basic structure of patient documentation

The second main element in the structure of patient documentation is provided by a combination of structural elements that are relevant for treatment for all occupational groups. This interdisciplinary part of the patient documentation is referred to figuratively, and with a certain degree of simplification, as the "chart" (see Fig. 34 oben). However, it includes more than just graphs with the history of a patient's blood pressure, pulse, temperature, etc. For example, prescriptions and reports are also highly important for the use of LEP in the chart (cf. Fig. 20 on p. 59 and Fig. 21 on p. 60). The chart holds great potential for increasing the efficiency of treatment processes, e.g. for administering medication or coordinating appointments in the calendar (lab results, EKG, X-rays, etc.). The structural elements of the chart should be assembled by doctors, nurses, midwives etc. working together.

Alongside traditional structural elements of the chart, elements like a list of "interdisciplinary problems/complications" will increasingly become a focus of structured documentation with an interdisciplinary orientation in LEP applications (cf. Fig. 33, p. 86). At present, approaches to patient documentation with an interdisciplinary and patient-centred orientation are best seen as "productive experiments". In addition to the structural elements mentioned about (cf. also Fig. 33 on p. 86 and Fig. 34 oben), other elements also show strong potential. One example is materials management, where e.g. the LEP intervention "Providing wound care" can be linked with wound dressing materials in the background; another is knowledge management, where e.g. the LEP intervention "Administering enteral feed" is linked with instructions (cf. Fig. 15, p. 42).

The goal of using LEP in patient documentation is to support optimal patient outcomes. In general, therefore, it should be possible to document services that recur daily, or interventions that are to be logically expected from a clinical perspective ("fixed services", "routine services", etc.), with as little effort as possible and without further complicating the everyday documentation flow – provided that this does not restrict an organisation's objectives. The three approaches sketched below all lead in this direction, though in different ways. The big challenge for all approaches and structures is to ensure that the treatment process remains clearly comprehensible in the patient documentation, allowing users to orient themselves quickly and straightforwardly and supporting optimal patient outcomes.

7.3.1 Clinical treatment pathways with LEP

LEP is very well-suited to patient-oriented use and documentation in clinical pathways[26] that span multiple occupational groups (Holler et al., 2002; Peters-Alt, 2005, p. 70; Rieben, Müller, Holler & Ruflin, 2003). These clinical pathways encourage needs-oriented diagnosis and treatment, and serve as a basis for optimising treatment processes and thus the quality of treatment (Optiz, 2004). LEP can be used in the front end or back end of clinical pathways (see section 5.4, p. 59).

[26] Also known as patient pathways.

One clinical pathway for which LEP is used is “mipp” (Model of Integrated Patient Pathways; Holler et al., 2002, Rieben et al., 2003). In that model, LEP is used to define the nursing service units that are deployed according to the guidelines for a particular treatment (Gilles, 2010, pp. 11, 12; mipp, 2001). Another pathway into which LEP has been integrated is known as “ClinPath”. Here, LEP services are assigned to the individual, modular pathway steps in such a way that when the completion of a pathway step is confirmed, the LEP services used are not individually selected, but automatically documented and added up (Tenckhoff, 2006).

Day	Time	Domain	Subdomain	LEP code	Content
1	11:25	Nursing	Nurs. meas.	52.05	Blood glucose determination
1	11:28	Nursing care	Nurs. meas.		med. svc. informed of BG value, order received
1	11:30	Nursing care	Nurs. meas.	53.04	bring insulin syringe for self-injection
1	11:31	Nursing care	Nurs. meas.	53.05	subcutaneous insulin admin. per doctor’s orders
1	17:25	Nursing care	Nurs. meas.	52.05	Blood glucose determination
1	17:28	Nursing care	Nurs. meas.		med. svc. informed of BG value, order received
1	17:30	Nursing care	Nurs. meas.	53.04	bring insulin syringe for self-injection
1	17:31	Nursing care	Nurs. meas.	53.05	subcutaneous insulin admin. per doctor’s orders
1	20:55	Nursing care	Nurs. meas.	52.05	Blood glucose determination
1	20:58	Nursing care	Nurs. meas.		med. svc. informed of BG value, order received
1	21:00	Nursing care	Nurs. meas.	53.04	bring insulin syringe for self-injection
1	21:01	Nursing care	Nurs. meas.	53.05	subcutaneous insulin admin. per doctor’s orders
2	02:00	Nursing care	Nurs. meas.	52.05	Blood glucose determination
2	07:25	Nursing care	Nurs. meas.	52.05	Blood glucose determination
2	07:28	Nursing care	Nurs. meas.		med. svc. informed of BG value, order received
2	07:31	Nursing care	Nurs. meas.	53.04	bring insulin syringe for self-injection
2	07:32	Nursing care	Nurs. meas.	53.05	subcutaneous insulin admin. per doctor’s orders

Table 24: Example of a clinical pathway for an insulin-dependent patient

One of the major advantages is that, alongside invoice verification, an LEP application in pathways can also be used directly for quality management by comparing the services specified in the pathway (“target”/planned services) with the services performed (“actual” services). Thanks to the services stored via the pathway, a target-cost perspective is maintained that allows for the use of modern management tools, thereby supporting a targeted service- and quality-oriented approach to financial management.

A software application that has integrated LEP should ideally allow users to directly create and edit clinical treatment pathways and plans (see section 7.3.2 unterhalb) that can be used in a patient-

focused way and customised for individual patients (Tenckhoff, 2006). For example, a pathway structure and the integrated LEP services can be used to directly control statistical analyses, but also instructions, guidelines, quality standards or administration, billing or laboratory systems (cf. Fig. 25, p. 71).

7.3.2 Standardised treatment plans with LEP

LEP is very well-suited to the documentation of standardised treatment plans. For the most part, e.g. in the case of standard nursing care plans, these involve occupation-group-specific combinations of interventions and health statuses (assessment, diagnosis, goal) that frequently *recur* in the given practice. For example, the intervention "Dispensing advice on pain management" is commonly seen with the nursing diagnosis of "Acute pain", or the "Providing gait training" intervention with "Impaired physical mobility" (cf. Table 25).

MD: femoral neck fracture							
	Admission	Day of surgery	Day 1 post-op	Day 2 post-op	Day 3 post-op	Day 4 post-op	Day 5 post-op
ND 1: Acute pain		x	x	x	x	x	x
ND 2: Impaired physical mobility		x	x	x	x	x	x
ND 3: Self-care deficit – Personal care		x	x	x	x	x	
Interventions for ND 1							
Dispensing advice on pain management	x	x	x	x	x	x	x
Performing specific assessment (pain)		x	x	x	x	x	x
Interventions for ND 2							
Performing lateral positioning		x	x	x	x		
Supine positioning		x	x	x	x		
Dispensing guidance/instruction	x						
Performing movement/mobilisation at bedside		x	x	x	x	x	x
Performing gait training				x	x	x	x
Performing micro-positioning		x	x	x	x	x	x
Interventions for ND 3							
Putting on / removing a patient's gown		x	x	x	x		
Monitoring skin condition	x	x	x	x	x	x	x
Performing a partial body wash		x	x	x	x		
Shower preparation / follow-up						x	x
Other interventions							
Conducting an admission discussion	x						
Conducting a discussion on coping with everyday life		x	x	x	x	x	
Performing a nursing visit	x	x	x	x	x	x	x
Conducting a discharge discussion							x
(...)							

Table 25: Example of a standardised nursing plan for a femoral neck fracture

The nursing diagnoses and interventions listed in Table 25 (MD = medical diagnosis; ND = nursing diagnosis) are, in turn, commonly seen in connection with the medical diagnosis (MD) "Femoral neck fracture"[27]. In this example, the LEP intervention terms are found in the front end (see section 5.4, p. 59).

[27] ICD-10 GM: S72.0 Fracture of head and neck of femur.

LEP interventions that are routinely performed repeatedly for all patients with particular diagnoses or operations, and for which the time spent is stable, are very well-suited to standardised treatment plans.

Treatment and nursing care plans can also be standardised only in connection with occupation-group-specific diagnoses; an example from nursing would be interventions for the nursing diagnosis "Self-care deficit – Personal care" (Table 26).

Self-care deficit – Personal care							
	Date	Date	Date	Date	Date	Date	(…)
Providing training in washing							
Performing a full body wash							
Performing a partial body wash							
Performing shower							
Washing the hair							
Monitoring skin condition							

Table 26: Example of a standardised nursing plan for "Self-care deficit – Personal care"

This covers a basic nursing care offering in a standardised way in patient documentation. The idea behind this is that users will *additionally* switch to a so-called specific or "individual" treatment plan if interventions diverge from the basic offering, and that those interventions can be separately planned and confirmed as completed there. Using the links in the LEP nursing process, other specific interventions are then suggested, or – if they are missing from the list of interventions available for selection – selected from the master catalogue.

Healthcare organisations can also use standardised treatment plans in patient documentation as simple lists with the most common LEP interventions, e.g. for a given specialist area, but with no explicit listing of health statuses. In Table 26 oben, for example, the LEP interventions "Performing a full body wash" or "Performing a partial body wash" would be entered in the standardised treatment plan without the nursing diagnosis of "Self-care deficit – Personal care".

Standardised plans should reduce documentation effort, but should not replace LEP interventions oriented toward individual patient needs. Each healthcare organisation needs to have appropriate regulations that specify when and how a switch from standardised to specific nursing plans should occur. Ideally, nursing plans can be extended to adapt them to a patient's specific intervention needs. Healthcare professionals should review standard plans regularly and adapt them to each patient's individual restrictions and resources. It is also important to adapt standard plans to reflect the current state of knowledge (cf. Fig. 15, p. 42). The distinction between these plans and clinical treatment pathways is a fluid one, and cannot be drawn sharply in all cases.

7.3.3 Reorganising LEP services into service bundles

Alongside clinical approaches (see sections 7.3.1 and 7.3.2), healthcare organisations use other criteria and classification principles to reorganise LEP services and interventions into service bundles, also known as service blocks, favourites, service complexes or service packages (Table 27).

"Major operation" day of surgery - Patient has major operation	
o	Monitoring breathing
o	Measuring the quantity emitted
o	Monitoring excretion
o	Monitoring drainage
o	Measuring fluids supplied
o	Monitoring skin condition
o	Monitoring pain
o	Measuring vital signs
o	Putting on / removing compression stockings
o	Putting on / removing a patient's gown
o	Performing movement/mobilisation at bedside
o	Supine positioning
o	Changing bed linen
o	Emptying/changing the bedpan
o	Providing/removing a urine bottle
o	(…)

Table 27: Example of a service bundle in a software application (AGFA Orbis)

The names used are not based on any standard objectives or interpretations of terms. The names of service bundles and the LEP interventions assigned to them can also be directly specified by a software application. A particular name (e.g. "favourites") may implicitly suggest a particular application goal, but there may also be more than one. The distinction from the clinical approach with treatment pathways and plans may be a fluid one, depending on how it is applied in a healthcare organisation's software systems.

When reorganising services, as always when constructing classification systems, it is essential to keep the focus consistently on the *intended application* all the way through to concrete implementation in the software (see section 2.1, p. 16). The intended application of a service bundle will determine how the services are structurally organised, the number and type of services, and their level of detail (cf. Fig. 1, p. 3). For example, routinely-performed LEP interventions with a constant time value can be documented or coded in a simplified way through the use of service bundles (cf. Table 28; FSO, 2014a, p. 49).

Service bundle	LEP interventions
Discharge	Conducting a discharge discussion
	Carrying out a visit with a physician / treatment team
	Compiling documentation for discharge
	Organising discharge
	Packing/unpacking patients' belongings
	Preparing and subsequently attending to a bed
Admission	Conducting an admission discussion
	Organising admission
	Organising meals
	Packing/unpacking patients' belongings
Post-op	Internal transportation
	Conducting a transfer discussion
	Making the bed
	Attending to the bed facility of a bedridden patient
	Providing a beverage
Pre-op	Internal transportation
	Conducting a transfer discussion
	Putting on / removing a patient's gown
	Making the bed

Table 28: Examples of service bundles

To ensure that service bundles (service blocks, favourites or service packages) provide the intended benefit, it is important to define the purpose of reorganising the services and interventions, and the criteria used to do so. Helpful questions to ask here include:

- What is the goal of this reorganisation? For example, is the goal
    - to simplify the documentation of services the case assignment that are performed every day ("routine interventions", "fixed services")?
    - to simplify the recording of specific documentation and discussion services ("case administration and discussion")?
    - to simplify the documentation of interventions that are directly related to an overarching treatment (e,g, an operation) or process element (e.g. admission)?
- Is there a single goal, or are there multiple goals?
- What area of activity does the goal apply to?
    - Patient documentation?
    - Recording of services?
    - Can the areas of activity be clearly distinguished from one another?
- Is the goal aligned with the analyses that the health organisation wants to conduct? (see section 5.12, p. 72)

7.4 Guidelines for patient documentation with LEP

Alongside mandatory general conditions specific to each country (e.g. relating to liability, regulations, social insurance or benefits), another deciding factor for establishing documentation requirements are the data that need to be collected from patient documentation for analytic purposes (cf. Fig. 29 on p. 76 and Fig. 35 on p. 101). Documentation requirements are dependent on the required scope and the level of detail in the data to be analysed (cf. Fig. 1, p. 3).

Correct documentation is an essential prerequisite for being able to use statistical analyses with LEP. The LEP data to be documented in a healthcare organisation must be consistent with the data needed for LEP analyses. If data needed for analyses are missing from the documentation, they will be incorporated into the calculations for analyses by means of allocation keys, or collected systematically in an additional service recording process (see section 6.1, p. 77, including Fig. 30 on p. 78). This situation requires a mix of patient documentation and recording of services (see Variant 2 in Fig. 35, p. 101, and see section 8.1, p. 101). Otherwise, it is nearly impossible to obtain usable analytic results without substantial effort and double recording.

The times when documentation takes place are extremely important to data quality. All later interpretations of documentation entries, calculations and analyses depend on the quality of the recorded data. Completing patient documentation promptly and systematically is essential from a patient-benefit perspective, and of central importance for treatment quality and data quality. Therefore, the times when documentation takes place must be optimally integrated into an organisation's work flows, and documentation entries should be added several times per day. When documentation entries are made promptly, service data are more complete and more accurate.

Despite the need to comply with legal requirements and the desired LEP analyses, organisations must avoid "going overboard" with documentation rules that make documentation more complicated (cf. Table 29 unterhalb). At best, all patient documentation guidelines provide a framework. Within such a framework, it is entirely possible to keep the scope, structure and form of patient documentation streamlined, and to make changes and reductions in the quantity of "required data". Of course, different opinions and approaches are possible here. Within its specified general conditions, each healthcare organisation can establish its own approaches to ensure the success of its core, management and support processes. The top priority is a patient documentation system that ensures optimal patient outcomes (see section 7.2, p. 87).

Since LEP is used by many healthcare professionals in patient documentation, consistent use is very important for data quality. Consistent use supports data quality, thereby contributing to the accuracy and reliability of the subsequent analyses. The following guidelines help to ensure data quality, and are mandatory for the documentation of LEP services (cf. Table 29).

Background and guideline	References
During patient documentation, the following requirements must be satisfied with regard to the properties of the data: • the scope (full, partial; degree of completeness) and • the level of detail (aggregated, detailed) of the LEP services to be documented. The scope and level of detail are determined by • the statistics and analyses selected by the healthcare organisation (LEP standard assessments), • the healthcare organisation's participation in data comparisons (PCAP Suisse, LEP data comparison), and • the implementation of automated coding schemes in the healthcare organisation (PKMS, CHOP 99.C1).	Fig. 1, p. 3 4.3, p. 46 5, p. 57 5.12, p. 72 Fig. 35, p. 101
Excluded from the LEP services to be documented: • *Not* documented: LEP services that provide no benefit for patient documentation, but are needed for LEP analyses and are therefore weighted (allocation keys). • *Not* documented: LEP services that provide no direct benefit for patient documentation, but are needed for LEP analyses and are therefore collected in an additional service recording process.	Fig. 30, p. 78 6.2, p. 79 6.3, p. 80 Fig. 32, p. 85

Included in the LEP services to be documented: • Interventions with case assignment are documented. Exceptions are documented. • Depending on the healthcare organisation's regulations, direct and/or indirect services with case assignment are also documented via clinical pathways, standardised treatment plans or service bundles. • To be documented is a service performed a single time ("ad hoc") which has a direct benefit for patient documentation and is not recorded in an additional service recording process (e.g. "Performing reanimation" or "Locating a patient"). • For a coupled service, the service recorded is the one that is considered as a service with case assignment (e.g. "Intravenously administering an injection"). • "Organisation-specific addenda" are documented as per the healthcare organisation's rules and regulations.	Fig. 8, p. 21 Fig. 9, p. 23 2.2.4.2, p. 23 5.6.1, p. 64 2.3.1, p. 31
Take information about a service into account during the documentation process: • Definitions at all stages of a service must be taken into account at all times. • The inclusions and exclusions for a service must be complied with at all times, e.g. "Performing partial personal hygiene activities" should be documented when "Washing the chest", "Washing the arms" and "Washing the back" are performed within a sequence of actions. • The guiding principle for documentation of services must be complied with at all times, e.g. preparation, follow-up or documentation of an individual intervention should *not* be recorded separately.	2.2.4.3, p. 24
Take additional detail into account for LEP services to be documented: • An intervention or individual service is specified in further detail (in accordance with the healthcare organisation's regulations), e.g. "Administering a liquid" is supplemented with the elements "orange blossom tea" and/or "half a lump of sugar".	Fig. 26, p. 73

Comply with guidelines for documenting time values: • When documenting the service, approved minute values must be reviewed in a situation-specific manner and modified if necessary (planning, performance). • When documenting the service, missing minute values must be used in a situation-specific manner (planning, performance).	2.2.6, p. 29
Preselected LEP services for patient documentation ("Department catalogue", "Unit catalogue", "Filters", "Core interventions"): • If an LEP service is not found in a selected service catalogue for patient documentation, a service from the master catalogue is documented.	5.3, p. 58
Services missing from the LEP classification are documented: • If a service needed for patient documentation is missing from the LEP classification of services, the "otherwise specified" services and a time value are documented (e.g. "Otherwise specified movement", "Otherwise specified safety"). • If an "otherwise specified" service is documented, it must be named as precisely as possible in an additional text during patient documentation, i.e. with as appropriate a name as possible for a healthcare intervention (on the 4th aggregation level of the LEP classification of services).	2.2.4.5.1, p. 25
The providers of each service are documented: • A healthcare professional who provides a service is assigned to this service or assigns themselves to this service during patient documentation. • Multiple healthcare professionals who provide a service are assigned to this service (e.g. two individuals for "Performing lateral positioning") or assign themselves to this service during patient documentation.	4.3.1, p. 48

The recipients of each service are documented: • A patient who receives a service has this service assigned to them during patient documentation. • Multiple patients (patient groups) who receive a service simultaneously have this service assigned to them during patient documentation. • Depending on a healthcare organisation's regulations, the service is also assigned to a party commissioning the task and other recipient types ("statistics code", e.g. for a research project) during patient documentation.	4.3.1, p. 48
The time when an LEP service is provided, as well as the corresponding time value, is documented before and/or after performance (supplementary and separate service recording): • Depending on a healthcare organisation's regulations, if a service is planned, the (planned) performance time of a service is documented ("target performance time"). • The actual performance time of a service is documented after it is provided (confirmation, "actual performance time"). • A service should be documented as soon as possible after the actual performance time.	Table 20, p. 74
Ensure documentation quality. Checking documented services for correctness, identifying and correcting any inaccuracies detected: • The providers of a service check whether the services performed by them are fully documented. • Incomplete documentation of performed services is corrected by the provider of the service.	9, p. 115 9.3, p. 116

Table 29: Guidelines for patient documentation with LEP

In some organisations, there are very few documentation requirements, while others have very strict documentation policies in place. The fact that documentation policies differ from one healthcare organisation to another represents a major challenge for uniform analyses with LEP. Extracting a uniform foundation of LEP data from patient documentation is essential for analyses (cf. Fig. 17, p. 47, and Fig. 35, p. 101).

A healthcare organisation should not switch arbitrarily between different approaches to documentation, but should follow a documentation policy that is continuous and coherent with regard to statistical analyses and mandatory requirements (e.g. patient safety, DRG coding). Whenever possible, new regulations should be compatible with a reasonable level of documentation effort. They should be seen as an opportunity to eliminate outdated documentation structures and requirements.

8 Recording of services and times with LEP

Besides determining the data needed for analyses and documentation requirements, clarifying the requirements for recording of services and times is a high priority when deciding which tasks should be handled through the use of LEP (cf. Fig. 6, p. 17). As a general rule, each healthcare organisation is free to decide which services and time values are to be recorded in its use of LEP – whether as a supplement to patient documentation or separately. However, the data recorded should be useful from the organisation's perspective for the analyses it wishes to perform. For example, should the service data primarily be used for quality assurance in the treatment process, for billing purposes, or for evaluating the resources used?

As with LEP applications in the area of patient documentation, the goal of documenting data once and using it many times (see section 5.1, p. 57) is a central task to be handled with LEP in the area of time and service recording as well. Service recording must be set up to work efficiently for the required analytics data and documentation requirements. If no redundant data are recorded in connection with service recording, but only those that are needed for the desired analyses, the amount of documentation effort does not increase unnecessarily across the healthcare organisation as a whole. Service recording should mirror the effort to the greatest extent possible.

The concept of service and time recording is a *cover term*. It is meant to be understood from a *multi-dimensional* perspective, as seen in our overview of the "what" and "how" of data collection in Fig. 27 (p. 75). Also relevant here are the scope, i.e. the degree of completeness, and the level of detail of the services to be recorded with a given approach to service and time recording (cf. Fig. 1, p. 3, and Fig. 5, p. 11). They determine the guidelines to be established for the recording of services and times. "Customised service recording" should be seen not as a buzzword, but as a practical reality. The objectives of different healthcare organisations' approaches to service and time recording with LEP can vary widely. They are determined by each healthcare organisation's perspective and the stakeholders involved.

From the perspective of a healthcare organisation's core processes, a service and time recording system comes into play when LEP data that are missing from patient documentation but needed for analyses and for mandatory requirements are not covered by weighting and allocation keys (automatic addition of services and time values). This is when Variant 2, as seen in Fig. 35 unterhalb, comes into play. With Variant 1, no recording of services and times is needed, since allocation keys are used for automatic addition of services and time values.

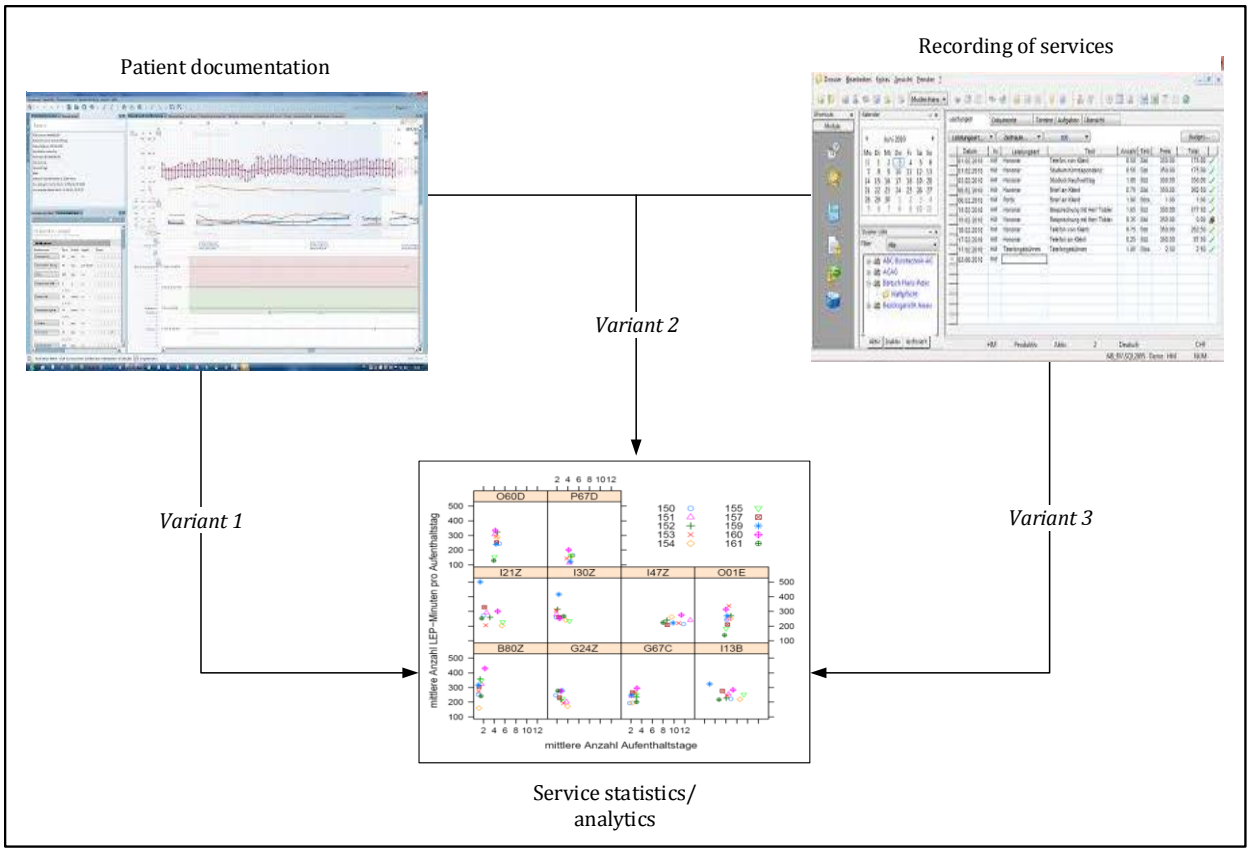


Fig. 35: Variants with patient documentation and service recording

However, as shown with Variant 3 in Fig. 35, service and time recording with LEP can also be used separately from patient documentation or in parallel to it, e.g. to establish a time-based comparison of service time and net work time (cf. Fig. 31, p. 81). Each of the three variants in Fig. 35 can be implemented with the LEP classification of services, e.g. with LEP Nursing 3 or LEP Midwives, and is suitable for organisations of any size and customisable for each organisation. Thanks to the modular structure (building-block design), service and time recording with LEP can be custom-tailored to each healthcare organisation's needs, and can be extended or reduced at any time if needed. The way in which LEP is constructed also allows for service and time recording to be performed at various degrees of scope and details: in terms of completeness, for example, an organisation might only record indirect nursing interventions and services without case assignment, or in terms of detail, it might record services at a higher level of aggregation (e.g. "Movement") and not at a lower level (e.g. "Providing gait training").

This means that the guidelines for service and time recording are specified in an organisation-specific way with regard to the scope and level of detail of the values to be recorded (cf. Table 30, p. 114), and that they are oriented toward either a supplementary or separate approach.

8.1 Service and time recording to supplement patient documentation

In this variant approach to using LEP, Variant 2 in Fig. 35 (oben), e.g. with LEP Nursing 3 or LEP Midwives 1, we have a mix between Variants 1 and 3, in that service data from patient documentation

are combined for analysis purposes with data from additional service recordings that are *not* integrated into analyses via weighting or an allocation key (cf. Fig. 29, p. 76). On this approach, the available LEP services are extracted from the patient documentation whenever possible. In addition, depending on a healthcare organisation's requirements (compliance with mandatory rules, required statistics, weighting and allocation keys), services that are not clinically relevant for documentation are recorded by means of"manual" service and time recording.

Services that are not relevant for documentation should not be confused with data that are *missing* from patient documentation because someone forgot to record them. Services that are not relevant for patient documentation are *not available* for analyses due to logical and justified reasons. They are not required to be documented, as is also the case with other forms of documentation like clinical treatment pathways or service bundles (see sections 7.3, p. 88, through 7.3.3, p. 93). Often, the services in question are "fixed services" ("routine services") *with* case assignment. These include direct services (e.g. "Providing/clearing away a beverage") or indirect services (e.g. "Maintaining patient documentation").

In summary, then, an approach to service and time recording that supplements patient documentation is used to record only those services and time values that are *not* clinically relevant, and therefore not relevant for patient documentation – but that are nevertheless relevant for the analyses that a healthcare organisation wishes to perform, e.g. for standard productivity (see 6.4, p. 82). Furthermore, they are not incorporated into the calculations for the analyses in question via allocation keys, and must therefore be collected by healthcare professionals in a supplementary process.

For this supplemental type of service and time recording, healthcare professionals should be able to record the additional data required for the analysis in the least possible investment of time, especially when the services and time values are only used for comparison with net work hours (cf. Fig. 31, p. 81). To ensure a successful application, it is also important not to let patient documentation become bloated in an attempt to reduce recording effort in supplemental service recording processes (see section 7, p. 85).

Through the system of aggregation levels in the LEP classification of services, services and time values can be recorded in detail or in aggregated form, i.e. at multiple different levels of aggregation in the LEP classification, and in different ways for different service groups (see section 8.3, p. 104). For example, interventions like "Administering food" are automatically copied from patient documentation into the service recording system. For comparison with work hours, additional services like "Providing/clearing away a beverage" or "Providing/clearing away a meal" are recorded at a higher aggregation level under "Nutrition" (cf. Fig. 41, p. 108).

LEP services at the 4th aggregation level ("Interventions") which are not relevant to documentation, but which are combined into so-called service bundles, can also be recorded later as part of of a supplemental service recording process (see section 7.3.3, p. 93).

A supplemental service and time recording process is sometimes also referred to as *partially-automated service recording* (Variant 2 in Fig. 35 oben). Fully-automated service recording then refers to a collection process in which only data that are collected automatically from patient documentation and other IT systems are used for analyses (cf. Variant 1).

8.2 Separate service and time recording

As shown with Variant 3 in Fig. 35 (p. 101), service and time recording with LEP can also be used entirely separately from patient documentation. In light of various developments in software technology, it can be considered as a "traditional" method of service recording. With the LEP Nursing 2 generation, for example, healthcare professionals record data and the associated time values separately from patient documentation. However, the quality of data recording is reviewed by comparing the recorded services with case assignment to the entries in the patient document to ensure that they match. Most healthcare professionals working with core processes would question the value of a separate process for recording services and times, and the associated recording effort. Therefore, the amount of effort that healthcare professionals are asked to invest in separate recording of times and services should be kept to a minimum, and the benefits of the process should be clear and readily comprehensible. Under no circumstances should a separate service recording process become bloated; rather, it must be focused on a specific set of goals. The goals of separate recording of times and services for analyses can vary, e.g. the goal may be

(1) an ongoing comparison of service times and net work hours (cf. Fig. 31, p. 81),

(2) a detailed one-time process analysis of services without case assignment.

As with a service recording process that supplements patient documentation, the structure of the LEP classification allows for services and time values to be recorded in detail or in aggregated form, i.e. at different levels of aggregation in the LEP classification (see section 8.3, p. 104).

In order to perform an ongoing comparison of service times and net personnel time, see goal (1) above, it is highly recommended that healthcare professionals be permitted to record time values and services at the highest possible level of aggregation, e.g. "Movement" rather than "Mobilisation" or a more detailed item like "Providing movement training", as clinically required for patient documentation. For services without case assignment, "Education and training" would be recorded rather than "Training", or an even greater level of detail such as "Conducting a learning situation" (cf. Fig. 38, p. 106, and compare with aggregation levels in Fig. 8, p. 21).

Despite the increased generality that comes with choosing a high level of aggregation to reduce recording effort (in theory), this continuous approach to the separate recording of services and times ignores the problem of double recording and data redundancy. Even if the recording effort associated with separate recording of services is kept to a minimum, healthcare professionals may still tend to

see it as an unnecessary additional effort if no benefit can be shown for core processes. With a modern software application, automatic recording of detailed data does not result in any additional effort for healthcare professionals, and healthcare organisations can avoid generating redundant data through double recording.

For a detailed one-time analysis of services *without* case assignment, see goal (2) above (p. 103), healthcare professionals record time values and services at a more detailed level of aggregation, e.g. "Conducting a learning situation" rather than "Training", or an even higher level of aggregation such as "Education and training" (cf. Fig. 40, p. 107; and compare with aggregation levels in Fig. 8, p. 21). Data is collected for a limited time, e.g. over a period of four weeks. Collection can focus on individual service groups, or it can take place in all service groups without case assignment. Although separate collection of detailed service data requires considerable effort, the benefit can be clearly demonstrated to healthcare professionals. For example, the operational objective for collecting detailed data may be to review a particular weighting or allocation key used for calculations in analyses, or it may be to achieve targeted results in process optimisation.

In addition to the two example goals discussed here (1 and 2, p. 103) for separate recording of times and services, there are of course many other possible uses that may be of interest to a given healthcare organisation.

8.3 Structure of service and time recording with LEP

Service and time recording is structured around the four hierarchical levels of the LEP classification of services. They are referred to as increasing levels of aggregation when moving up the hierarchy, or as increasing levels of detail when moving down the hierarchy (cf. Fig. 8, p. 21). The LEP structure means that, in principle, data can be recorded on any level as well as variably, i.e. in detailed or aggregated form or at a mix of different levels (cf. Fig. 5, p. 11, and 1.6, p. 10). Services and time values are recorded in different degrees of detail at the various levels of aggregation, depending on what data are needed.

In the following, we will provide an overview of the different levels by presenting a few examples. It is essential to understand the connection between the desired analyses and the level of aggregation at which a service is recorded (Fig. 36).

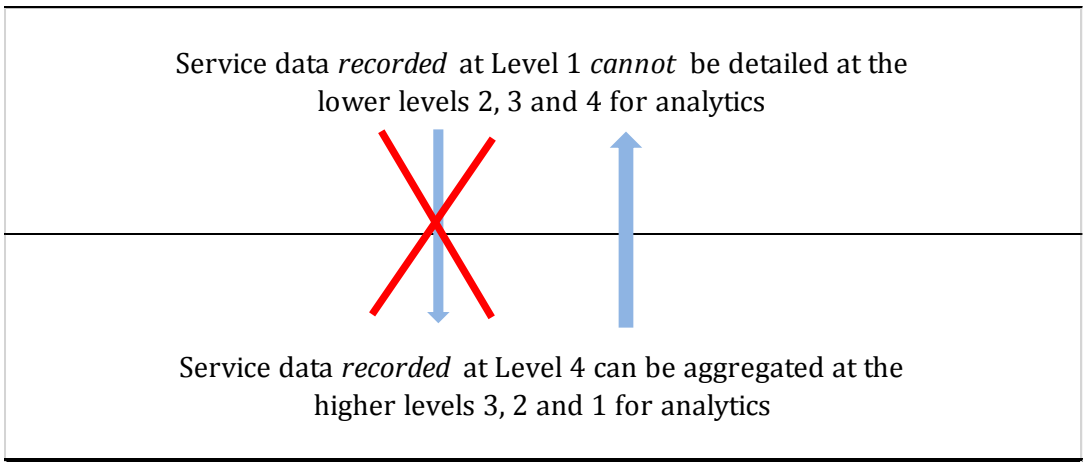


Fig. 36: Relationship between recording level and ability to analyse data

If LEP is used in an organisation with limited software automation options and poorly networked data flows, the predominant viewpoint may be that recording detailed services is too time-consuming to justify full recording of services and times. In this case, services would be recorded at a high level of aggregation, e.g. at the level of service groups like “Movement” or “Nutrition”. The recorded data are then complete in terms of their scope, but with consequences for analytics as shown oben in Fig. 36. The desired level of precision in analyses of operational processes, the scope and level of detail at which service data are recorded, the healthcare organisation’s technical potential in terms of its software systems, and the amount of data recording time required of healthcare professionals are all closely interrelated. It is important to ensure that these various aspects are weighed carefully against one another to establish a balanced cost-benefit ratio (Besson, 2013, p. 259).

8.3.1 One-level service and time recording

Suppose that a key objective for a particular healthcare organisation is to analyse the proportions of time spent on services with vs. without case assignment. This can be achieved with minimal recording effort through the use of a one-level approach to service and time recording (Fig. 37).

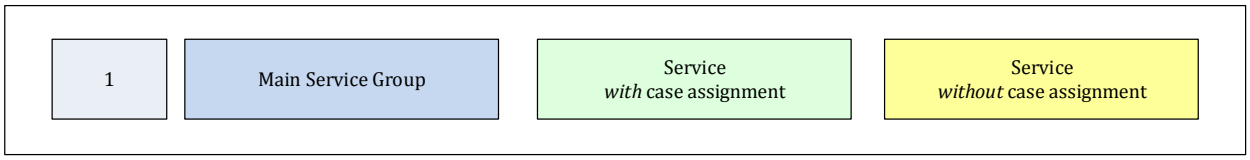


Fig. 37: One-level service and time recording

To ensure a certain level of confidence at this highest level of aggregation in the LEP classification system, it is recommended that the data be simultaneously aligned with net work time as the two service and time blocks are recorded. In terms of scope, for example, a one-level approach can be used to record only the total time value for services without case assignment, in order to roughly estimate whether the allocation key for time spent on services without case assignment is plausible for calculations used in analyses, or whether it needs to be revised.

8.3.2 Two-level service and time recording

Suppose that a healthcare organisation wants to run an analysis of all services performed by healthcare professionals at a given cost centre as compared to net work hours. In terms of scope, this will require a complete recording of service and time values. Service data from patient documentation will not be used, nor will allocation keys. Therefore, in order to keep the data recording effort to a minimum, all LEP service groups and the corresponding time values are recorded at the second level, e.g. “Movement” for 75 minutes or “Education and training” for 110 minutes.

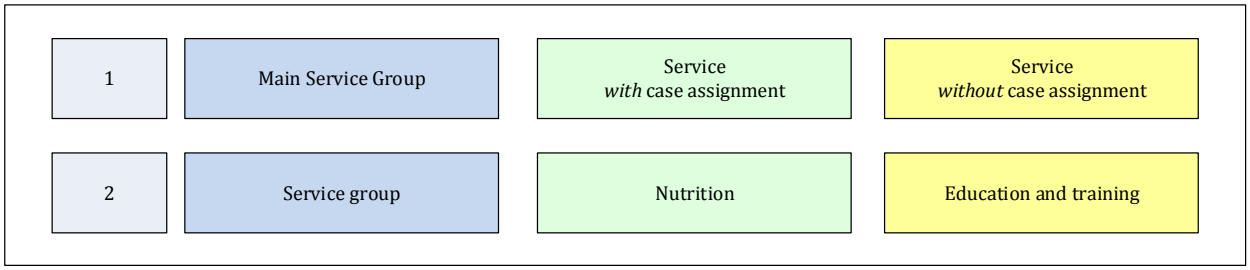


Fig. 38: Two-level service and time recording

Data collection scenarios like these may focus on different types of questions. For organisation-internal controlling purposes with an eye toward cost-centre costs and cost-centre balancing, the question may be: How much effort in minutes do education and training services require, and how high are the associated costs?

As with the one-level recording approach, it is again recommended that the data be simultaneously aligned with net work time to ensure a certain degree of plausibility, and to ensure that healthcare professionals can have confidence in the data they record. For example, if the total work hours available from a personnel management system (e.g. from a PDP system) amount to 8.25 hours, the service times will be subtracted from this as they are recorded. When a zero value is reached (i.e. when the difference between net work hours and recorded service times is 0), recording of services and time values is stopped. However, we cannot conclude from this that the time values recorded in this way would necessarily be more valid for service groups or provide greater reliability than time values collected through other processes.

8.3.3 Three-level service and time recording

Suppose that a healthcare organisation wants to run an analysis of services without case assignment at a given cost centre as compared to net work hours, over a period of three months. Service data

from patient documentation cannot be used here, since such data are generally assigned to a case. The service data for the desired analysis should be complete and as highly detailed as possible, but without exceeding a reasonable level of data recording effort during the three-month period. Therefore, the healthcare organisation opts for complete recording of services and time values without case assignment on the third level, that of service subgroups (Fig. 39).

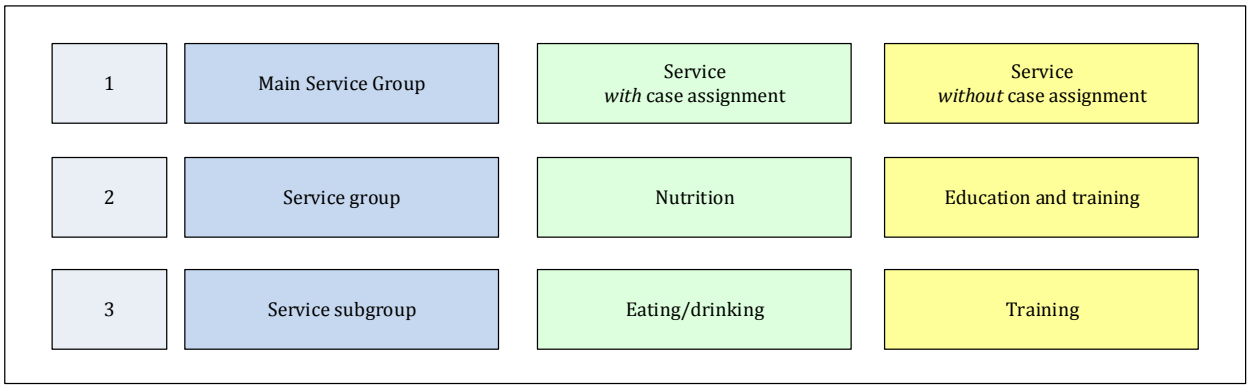


Fig. 39: Three-level service and time recording

On this approach, LEP service subgroups and their corresponding time values are recorded, e.g. "Training" for 180 minutes, "Project management" for 40 minutes, or "Quality management" for 45 minutes.

8.3.4 Four-level service and time recording

Now let's consider a healthcare organisation that wants to perform a detailed analysis of two service groups without case assignment over a period of three weeks ("time-limited") as part of a data-driven process optimisation effort. Therefore, the healthcare organisation opts for complete recording of the two service groups and time values without case assignment on the fourth level, that of individual services (Fig. 40).

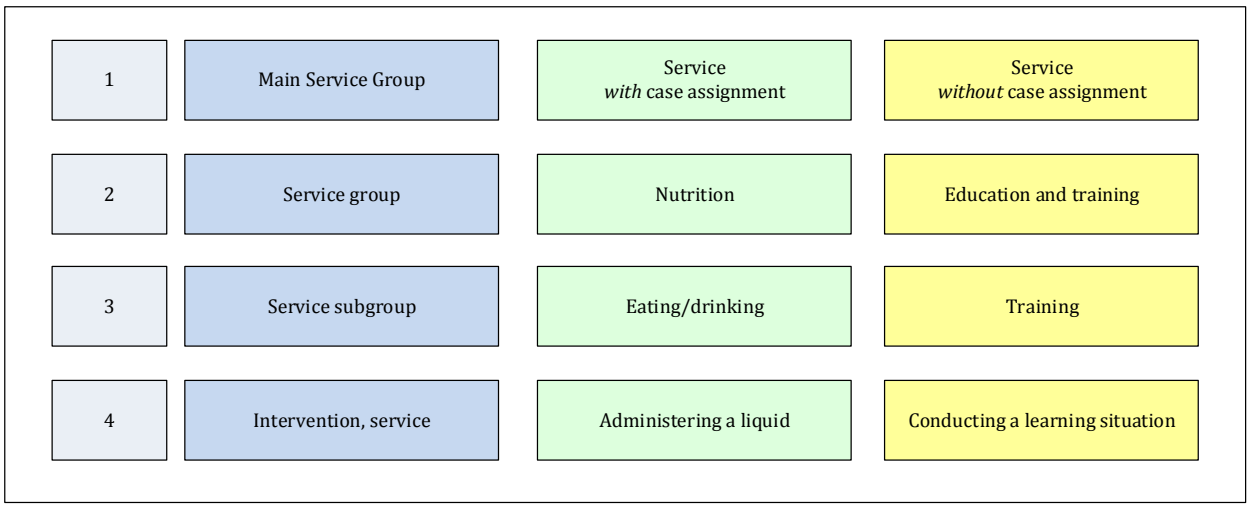


Fig. 40: Four-level service and time recording

For example, individual services are recorded with their corresponding time values, such as "Conducting a learning situation" for 20 minutes or "Measuring quality" for 15 minutes. In another

healthcare organisation performing a detailed and complete analysis of services with case assignment, for example, services with case assignment that are not relevant for documentation (e.g. direct interventions like "Providing/clearing away a beverage") or indirect services (e.g. "Maintaining patient documentation") are not included in the analysis via allocation keys. As a result, these services are continuously recorded at the fourth aggregation level using service bundles (see section 7.3.3, p. 93).

8.3.5 Service and time recording at multiple levels

Suppose that a healthcare organisation wants to run an analysis of all services performed by healthcare professionals. This will require the healthcare professionals to perform a complete recording of service and time values. Allocation keys will not be used; wherever possible, however, the analysis should be based on service data that have already been automatically collected for patient documentation. In order to keep the effort involved in this supplementary service and time recording process at a reasonable level, all missing individual services and time values will be recorded at the second classification level, i.e. the service group level (Fig. 41).

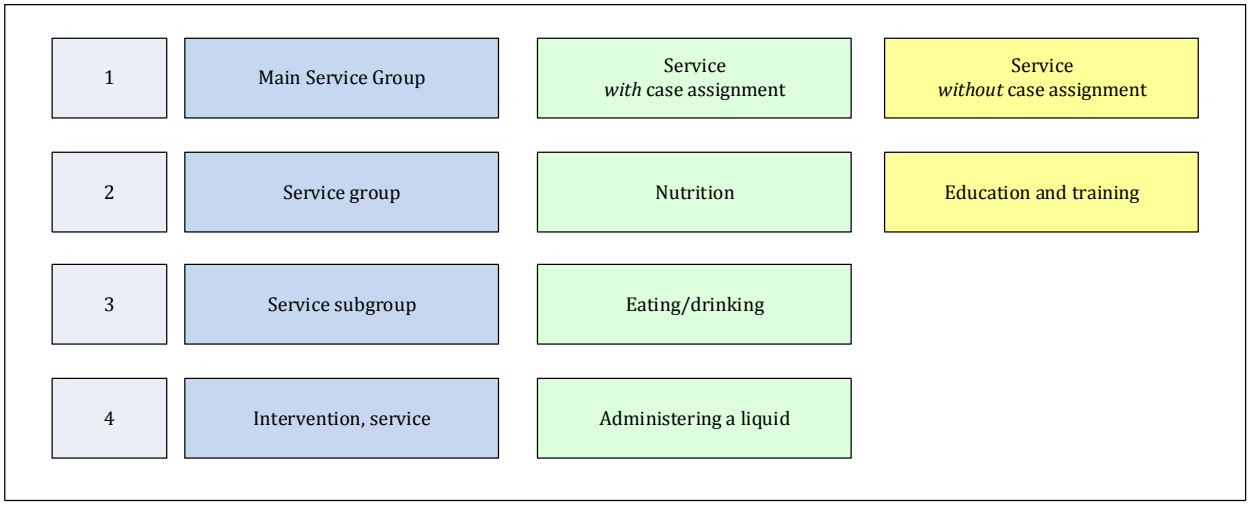


Fig. 41: Service and time recording at multiple levels

As a service from the "Nutrition" group which is subject to mandatory documentation, for example, "Administering a liquid" (5 minutes) is automatically recorded from patient documentation for use in the analysis. In a supplementary step, "Providing/clearing away a beverage", "Providing/clearing away a meal", and "Assisting in eating/drinking" are aggregated and recorded under the "Nutrition" service group (10 minutes). All together, this results in a time value of 15 minutes for the "Nutrition" service group. Even when recording at multiple levels, it is important to remember the relationship between the level at which services are recorded and the ability to analyse the recorded data: If services are recorded at high aggregation levels, analyses cannot be carried out at lower levels (i.e. in greater detail). In the above case, a detailed analysis can be carried out with reference to the individual interventions (cf. Fig. 36, p. 105).

For a complete analysis of services, indirect services are often collected in a multiple-level recording process that is supplementary to patient documentation (if they are not recorded via service bundles). For example, the services “Maintaining patient documentation”, “Compiling documentation for discharge”, and “Organising patient appointment” are aggregated and recorded under the “Organisation/Administration” service group. In addition, for a complete analysis of services, all services without case assignment are recorded in a supplementary process, since they are not relevant for patient documentation, e.g. “Education and training”, 30 minutes (cf. Fig. 41 oben).

8.4 Guidelines for service and time recording with LEP

In addition to correct patient documentation, correct recording of services and time values is an essential prerequisite for using statistical analyses with LEP. Data quality represents an even bigger challenge for service and time recording than for patient documentation, since it provides no direct benefit in the treatment process or for interdisciplinary communication. In turn, the times when services and time values are recorded are extremely important for data quality. Recording services promptly and systematically is essential to ensuring the completeness and accuracy of the desired analytics data. A systematic approach to recording also requires that each service be recorded by the healthcare professional who provided the service. As long as the service offering does not change, it should be possible to continue providing services in order to keep recording effort to a minimum. If individual aspects of the service spectrum are difficult to evaluate, even with guidelines in place, healthcare professionals should draw on the knowledge and experience of their colleagues, e.g. by discussing and clarifying difficulties in recording services while multitasking[28] with fellow members of the treatment team. Or to take another example: In systems where LEP services are linked with assessments, diagnoses or treatment goals, these types of elements can be useful in cases when the target of an action, and therefore the attribution of a given service to "Excretion" or "Movement" for recording purposes, is unclear. If the diagnosis is a femoral neck fracture, for example, "Movement" is recorded.

Because many healthcare professionals use LEP for both patient documentation and service and time recording, or in some cases only for the latter, consistent use is especially important for data quality. By supporting data quality, consistency contributes to the accuracy and reliability of the subsequent analyses. The following guidelines help to ensure data quality, and are mandatory for the recording of LEP services and times (cf. Table 30).

[28] Performing two or more overlapping individual services at the same time.

Background and guideline	References
The following requirements for data properties, or for the quality of the LEP services and time values to be recorded, must be met when recording service sand time values (supplementary and additional service recording processes): • the scope (full, partial; degree of completeness), • the level of detail (at what level; aggregated, detailed) and • the time period (daily, weekly, at intervals; continuously, for one month per quarter). The scope and level of detail are determined • by the decision as to whether an organisation will use a service recording process that supplements patient documentation, or a separate service recording process, • by the statistics and analyses selected by the healthcare organisation (LEP standard assessments), • by the healthcare organisation's participation in data comparisons (PCAP Suisse, LEP data comparison), and • by the implementation of automated coding schemes in the healthcare organisation (PKMS, CHOP 99.C1).	Fig. 1, p. 3; 4.3, p. 46; 5, p. 57; 5.12; p. 72 Fig. 35, p. 101
Included in the LEP services and time values to be recorded for a *supplementary* service and time recording process: • Record the services and time values that are *not* documented in patient documentation, or that are *not* included in the calculations for analyses via allocation keys. • For a coupled service, record those services that are *not* documented, e.g. "Conducting a learning situation" by the teacher ("Intravenously administering an injection" is documented by the learner). • "Organisation-specific addenda" are recorded as per the healthcare organisation's rules and regulations.	Fig. 30, p. 78 6.2, p. 79 6.3, p. 80 Fig. 32, p. 85 5.6.1, p. 64 2.3.1, p. 31
Final recording of services and time values: • Services and time values must always be recorded in their final state, i.e. at the level from which the healthcare organisation does not require any further subdivision or detail. Depending on the selected LEP level, services may be recorded at one, two, three, four, or multiple levels.	Fig. 37, p. 105 Fig. 38, p. 106 Fig. 39, p. 107 Fig. 40, p. 107 Fig. 41, p. 108

Take information about a service into account during the recording process: • Definitions at all stages of a service must be taken into account at all times. • The inclusions and exclusions for a service must be complied with at all times, e.g. "Performing partial personal hygiene activities" should be coded when "Washing the chest", "Washing the arms" and "Washing the back" are performed within a sequence of actions. • The guiding principle for the recording of services must be complied with at all times, e.g. preparation, follow-up or documentation of an individual service should *not* be recorded separately.	2.2.4.3, p. 24
Comply with guidelines for documenting time values (supplementary and separate service recording process): • When recording the service, approved minute values must be reviewed in a situation-specific manner and modified if necessary. • When recording the service, missing minute values must be used in a situation-specific manner.	2.2.6, p. 29
The number of services to be recorded is determined by the level of aggregation/detail (supplementary and separate service recording process): • The number of services must be recorded in accordance with the healthcare organisation's regulations: the number of service groups, service subgroups or individual services/interventions. • Services performed multiple times must be recorded the same number of times as they were performed during the treatment process.	8.3, p. 104 Fig. 36, p. 105
When assigning individual services to service subgroups or service groups at a higher aggregation level (e.g. to "Mobilisation" or "Excretion"), the circumstances must be taken into account when recording the service (supplementary and separate service recording process): • When recording a service at a higher aggregation level, i.e. when recording a service group (e.g. "Movement") or a service subgroup (e.g. "Mobilisation"), the healthcare professional recording the service must take into account the diagnosis or goal that was the basis for the performance of individual services. • Depending on the circumstances under which individual services are provided, one or more service groups or subgroups will be selected.	Fig. 38, p. 106 Fig. 39, p. 107

Preselected LEP services for the recording of services and time values (supplementary and separate service recording process): • If an LEP service is not found in a selected service catalogue for service recording, a service from the master catalogue is recorded.	5.3, p. 58
Services missing from the LEP classification are recorded (supplementary and separate service recording process): • If a service needed for the service recording process is missing from the LEP classification of services, the "otherwise specified" services and a time value are recorded (e.g. "Otherwise specified movement", "Otherwise specified safety"). • If an "otherwise specified" service is recorded , it must be named as precisely as possible in an additional text when recording services and times, i.e. with as appropriate a name as possible for the service at the relevant aggregation level of the LEP classification of services.	2.2.4.5.1, p. 25
The providers of each service are recorded (supplementary and separate service recording process): • A healthcare professional who provides a service is assigned to this service or assigns themselves to this service when recording services and times. • Multiple healthcare professionals who provide a service are assigned to this service (e.g. two individuals for "Performing lateral positioning"), or assign themselves to this service, when recording services and times.	4.3.1, p. 48
The recipients of each service are recorded (supplementary and separate service recording process): • A patient who receives a service has this service assigned to them when services and times are recorded. • Multiple patients (patient groups) who receive a service simultaneously have this service assigned to them when services and times are recorded. • Depending on a healthcare organisation's regulations, the service is *also* assigned to a party commissioning the task and other recipient types (e.g. student or "statistics code" for a research project) when services and times are recorded.	4.3.1, p. 48

The time when an LEP service is provided, as well as the corresponding time value, is recorded before and/or after performance (supplementary and separate service recording): • Depending on a healthcare organisation's regulations, if a service is planned, the (planned) performance time of a service is recorded ("target performance time"). • The actual performance time of a service is recorded after it is provided (confirmation, "actual performance time"). • A service and time value should be recorded as soon as possible after the actual performance time.	Table 20, p. 74
Perform a plausibility check of the sum of the recorded time values for each service provider (supplementary and separate service recording process): • As the aggregation level of the recorded time values increases, e.g. 60 minutes for a treatment, it is recommended that the data be simultaneously aligned with the net work hours for the corresponding service provider, i.e. the remaining net work hours (e.g. 7 hours) are visible after the 60 minutes for the treatment have been deducted.	9.3, p. 116
Perform a plausibility check of the recorded services (supplementary and separate service recording process): • As the aggregation level of the recorded services increases (e.g. "Treatment"), it is recommended that the services be compared with the entries in the patient documentation as soon as they are recorded.	9.3, p. 116
Ensure the quality of recording; check recorded services for correctness, and identify and correct any inaccuracies detected: • The providers of a service check whether the services performed by them and the associated time values are fully recorded. • Incomplete documentation of performed services and their time values is corrected by the provider of the service.	9, p. 115 9.3, p. 116

Table 30: Guidelines for service and time recording with LEP

The services are recorded with the LEP classification of services provided by healthcare professionals (see section 2.2, p. 17). The LEP classification structure allows services to be recorded at varying scopes and levels of detail. LEP gives every healthcare organisation the freedom to document whatever it sees as useful for its analyses, using either a supplementary process or a separate one. As such, LEP does not impose any guidelines that are limited to a single specific recording situation.

Depending on the software application and its degree of adaptation to the organisation's needs, the service recording process may be supported by additional programs. For example, it is recommended that organisations use an interface program to connect to the personnel management system (cf. Fig. 25, p. 71) if net work hours are the focus of its analyses. In this way, a continuous alignment can take place between employees' current work hours (e.g. overtime and shortfalls) and the times recorded by service providers, and an electronic "time clock" can be activated to assist in recording times. If the total net work hours and the service times diverge from one another, an error message is triggered. With this type of approach, however, it is important to be conceptually clear on how allowance times are to be dealt with (cf. Fig. 31, p. 81). Other additional programs can serve as

- assignment tools (e.g. to assign a service to multiple service recipients and providers simultaneously),
- warning systems (e.g. if a service group has a recorded time value of less than 10 minutes),
- special data entry tools (e.g. lists of favourites, i.e. listing a service provider's most common services first, or allowing services from the previous day to be automatically copied over),
- search tools, or
- accuracy checkers. These run automatically, either as soon as the user leaves a field or when they save their changes. For example, the totals for personnel and for clients are automatically checked to confirm that they are equal. If these sums differ, you will receive an error message, and the form can only be saved when the error has been resolved.

9 Data quality

The guidelines for patient documentation and for service and time recording are intended to help ensure consistent use of LEP in patient documentation and in service and time recording. Consistency is essential for data quality, and thus for the accuracy and reliability of the subsequent analyses as well. With plausibility verification routines and reviews of the accuracy and reliability of the data, in conjunction with targeted training and consulting efforts, data quality can be systematically improved. As a rule of thumb, it's useful to remember that the more analysis results "flow back" to the people who record the data, the better the data quality will be.

9.1 Challenges

In general, it is very difficult to define and quantitatively record personal, interactive services focused on safety, comfort or emotional state and carried out as a single act, as healthcare interventions are (Schroeter, 2005; Strauss, 1997). Typical specific recording problems include:

- determining the start and end point of an action;
- separating action sequences and flows into individual actions, e.g.
    - reanimation or alerting, positioning, etc.,
    - eye care or evaluating the eyes, cleaning the eyes, instilling eye drops, etc.;

- the interleaving of individual actions during their chronological progression (washing patient A, administering an infusion for patient B, exchanging information with patient C, continue washing patient A);
- interrupted actions (caused e.g. by other people, phone calls, patient call system)
- multitasking (washing patient A and simultaneously discussing discharge)

(Bartholomeyczik, 2007; Bartholomeyczik & Hunstein, 2001; Collins, Currie, Patel, Bakken & Cimino, 2007; Hermetinger, 2010; Kalisch & Aebersold, 2010; Malloch & Conovaloff, 1999; Näf, 2003).

These challenges must be addressed thoroughly in training and consulting sessions relating to LEP.

9.2 Factors influencing time values

A wide variety of variables that can influence nursing care workload besides a patient's health status have long been mentioned in the literature (Baumberger, 2001, p. 6). Thibault (1990, p. 28) provides a comprehensive early overview of variables that can potentially have an impact on the time required for services that is still relevant today. Alongside features relating to health status, her overview also mentions the size of the ward and the technical equipment available on site, the treatment structure (e.g. functional nursing, patient-centred nursing) or features of the healthcare personnel (experience, teamwork, ability to organise work, level of education, etc.) (cf. Bartholomeyczik, 2008, p. 13).

Information about the patient's health status always provides only a partial explanation of the time needed to provide services (Baumberger, 2001, p. 6; Isfort & Brühl, 2007, p. 672; Morris et al., 2007, p. 469). Likewise, the large variety of possible influencing factors implies that time values for individual services cannot be determined in isolation, i.e. independently of the patient's health status and other influencing variables (Haasenritter, Wieteck & Bartholomeyczik, 2009, pp. 681–682; Jansen, 2013). In light of the many factors that influence the time spent on services, it is clear that the time needed to provide services is a complex target variable that cannot truly be measured precisely in the daily service provision routine (Berthou, 1995; Isfort, 2008, pp. 49–58).

Therefore, we have fundamental reasons to question any attempt to establish a normative, unalterable way of measuring the time required for nursing care services (Bartholomeyczik, 2007; Baumberger, 2015b). Any time value is always an approximation to an actual time value measured by a particular method, and differences can lead to distortions (Bartholomeyczik, 2008, p. 19; Bartholomeyczik & Hunstein, 2001; Isfort, 2008, pp. 49–58; O'Brien-Pallas, Cockerill & Leatt, 1992).

9.3 Plausibility checks

For LEP analyses, the documented and recorded data should be subjected to plausibility checks[29], e.g. with PCAP Suisse (see section 4.3.3, p. 52). Whether these data come from patient documentation or

[29] These checks serve to ensure that the data are "plausible", i.e. reasonable, likely or believable.

from a service recording process, the plausibility checks are performed after data collection and before the actual LEP analyses. Different plausibility criteria can be used here, as seen in the examples in Table 31 unterhalb.

Number of cases delivered	Number of cases delivered for data comparison.
Query	**Plausibility rule**
Missing values	The number of values missing in the provided dataset, e.g. no DRG code, no LEP minutes, no length of stay. Cases with missing values are excluded from the data comparison.
Deviation of total nursing workload from sum of service groups	The deviation between the total nursing workload for a case ("1st column in dataset") and the sum of nursing workload values for the individual LEP service groups. Cases with deviations are excluded from the data comparison.
Number of relocation cases	The number of relocation cases in the provided dataset. All relocation cases are excluded from the data comparison.
Total nursing workload < 60 minutes	The number of cases in the provided data set with a total nursing workload of less than 60 minutes. These cases are excluded from the data comparison.
Nursing workload per day < 30 minutes	The number of cases in the provided data set with a nursing workload per day of less than 30 minutes. These cases are excluded from the data comparison.
Nursing workload per day > 1440 minutes	The number of cases in the provided data set with a nursing workload per day that is greater than 1440 minutes. These cases are excluded from the data comparison.
Nursing workload in only one service group	The number of cases in the provided data set that show a nursing workload in only one LEP service group. These cases are excluded from the data comparison.
Number of cases accepted	Number of cases for data comparison after plausibility check
Number of DRGs accepted	Number of case groups as per SwissDRG in data comparison after plausibility check

Table 31: Examples of plausibility verification routines that can be automated (PCAP Suisse)

Combinations of LEP services and health status information can also be used here. A plausibility rule of this type might then say something like: "A patient who has been evaluated as having 'no ability for self-care' in an assessment in the Movement category must have services relating to movement, e.g. 'Mobilisation at bedside' or 'Lateral positioning'." Targeted plausibility checks can also be performed for services that are seen as "problematic" within a given healthcare organisation.

Sample points with impossible (or at least questionable) services should be selected and reviewed carefully again before they are used in analyses. Automated plausibility checks based on criteria like the examples shown in Table 31 oben might lead to 2% of the delivered cases being excluded from an analysis. These cases are then shown using tables and graphs. The individual implausible sample points are then reviewed in greater detail to identify any errors that may be present in the documented and recorded services, and to report these back to the healthcare professionals, patient care units and managers in charge. They can then work with "error lists" like these with the goal of improving data quality. It is usually possible to start with training or data preparation. Plausibility checks can help to identify and resolve problems with data quality right from the moment when they are recorded, by leading to changes in documentation and recording guidelines. Or a message could appear if entries are missing in the patient documentation or service recording system for certain services for which errors frequently occur.

Individual healthcare organisations will employ different plausibility verification practices. For example, 10 hospitals in the SwissDRG network provided information through a survey about their coding and plausibility verification routines (Baumberger, 2014a, pp. 50–53). Each of the hospitals used plausibility verification routines and data-cleansing. In addition to both internal and external audits, they also used data comparisons. Individual problem areas were defined. Viewed as a whole, the data quality could be assessed as good, based on the answers from these (anonymised) hospitals.

In the following, we will examine the process of performing plausibility checks and ensuring data quality based on the example of the procedures used at the University Hospital Zurich (UHZ). Each department has its own "LEP representative". This may be the department director herself, or a healthcare professional that she appoints to check the recorded data on a daily basis. A central "service recording & controlling" support section reviews the accuracy and completeness of the LEP data using plausibility verification routings in the "LEP Management Cockpit" software tool. Once a month, departments receive a data quality report and evaluate data quality with a standardised questionnaire. Cases with records that contain clinically unusual nursing care workloads are analysed in greater detail by the support section. Any difficulties in recording are discussed with the affected units and resolved. Cases are discussed within the units as well. All new employees receive systematic training, and follow-up training is provided periodically. At a higher level, the UHZ compares data from about 15 hospitals in the Zurich LEP Regional Group of the Swiss Interest Group of LEP Representatives (SIG). Any deviations are analysed by the regional group. The support section assesses the data quality for the relevant period as good, based on an analysis in the "LEP Management Cockpit" software tool (Jucker & Tobler, 2011).

An advantage of plausibility checks is that they can be performed with relatively little effort. A disadvantage is that they do not reveal certain less obvious discrepancies and deviations. For these, however, tools are available in the form of specific LEP analyses to identify statistical outliers in service data from patient documentation (Baumberger & Bürgin, 2016).

9.4 Reliability and validity of LEP time values

LEP and its predecessors have been used in practice for over 20 years. During this time, regular developments and new versions have resulted from users' feedback and suggestions for improvement. Authors report that LEP is well-accepted, straightforward to use, and practical (Isfort, 2002, p. 500; Weber et al., 2003), and that LEP can be seen as a readily comprehensible method that is easy to apply (Vojnovic, 2010, p. 85). This might also be implied by its ongoing expansion over a period of many years, which continues to this day. Thus far, however, only a few incomplete results have been published with regard to the reliability of data recording and the validity of standard time values in LEP (Homburg, Baumberger & Abderhalden, 2006; Horbach & Behrens, 2004; Isfort, Klug & Weidner, 2002; Näf, 2003). The observed gaps in this regard can be rightly criticised (Isfort, Weidner, Brühl & Zinn, 2004).

Inter-rater reliability between recorders and observers reaches 85.4% agreement for individual services in Homburg's study (2006). In a study by Näf (2003, S. 18-20; 42), categorical positive agreement (Cicchetti & Feinstein, 1990; Uebersax, 2002) between recorders and experts reaches an overall score of 0.6, and the sensitivity value is 0.65. Time-weighted agreement lies between 0.72 and 0.89, depending on the level of aggregation.

The normative LEP time values recorded were slightly higher than the measured time values (Homburg et al., 2006), and showed significant dispersion in some cases according to Isfort's measurement method (2002, pp. 57–61). In Näf's study, raters recorded an average of 1.3 times as much LEP time based on video sequences as experts did, and 1.7 times as the times indicated in the video sequences (Näf, 2003, pp. 21–22). The variety of different conceptions and recording methods for time values (Isfort et al., 2002, pp. 59–61), as well as fundamental methodological difficulties in measuring service times, make a conclusive comparison of LEP standard times and recorded time values difficult to achieve (Bartholomeyczik & Hunstein, 2001; Malloch & Conovaloff, 1999, p. 49).

9.5 LEP in scientific studies

Against the background just described, it is important for purposes of transparency that scientific studies describe the method by which the time values under discussion are recorded. Ambiguous terms like "real times" must be defined in conceptually and methodologically transparent ways. With this in mind, it is recommended that time values recorded with LEP be referred to as "LEP times" (Baumberger, 2015b).

LEP has been used in studies as a measurement instrument for nursing care workload in DRG case groups (Baumberger, Bürgin & Bartholomeyczik, 2014; Fischer, 2002, pp. 172–190; Stausberg, Dahlmann & Maier, I., 2006) or for the identification of service patterns in nursing data (Sellemann, 2010; Sellemann, Stausberg & Hübner, 2012). LEP has also been used for research projects, e.g. to explain the relationship between patient status from a nursing perspective and nursing workload (Baumberger, 2002; Baumberger, 2005b; Baumberger, 2014a; Buchmann, 2012; Fiebig, 2007; Hunstein, Fiebig, Sippel & Dintelmann, 2007; Mueller, Lohmann, Strobl, Boldt & Grill, 2010; Schmid, 2007; Zimmermann, 2013) or to investigate the relationship between ICD diagnoses and nursing workload (Eberl, Bartholomeyczik & Donath, 2005; Mösli, 1997) and about ischaemic insult and nursing workload (Ryser, Beer & Kesselring, J., 2007). In other studies, LEP was mapped and reviewed for service and time recording (Gärtner, 2008; Walzl, 2008), or compared with other systems, e.g. with PPR (Gelderblom, Halbauer, Nareike-Sossong, Nieberle & Pruss, 2003; Giesel, 2010) or with PRN (Brügger & Maeder, 2002c).

10 LEP products

Material LEP products include the LEP classifications or mapping tables, while immaterial products include services like consulting or training (see section 12, p. 141). The different variants of the material LEP products can be categorised into three product lines or product groups (Table 32).

LEP Documentation and LEP Service Groups
LEP Treatment Process
LEP Special Products and LEP Individual Products

Table 32: The three material LEP product groups

The individual products within the first two groups complement one another. Within each LEP product group, combining the individual LEP products offers a wider range of possible uses. The LEP product groups themselves are also closely interrelated and can be used to complement one another. Starting from the top of Table 32, combining with the next product group in the list provides more flexibility of use, both with regard to analyses and with regard to patient documentation or service and time recording.

From the different variants of LEP products within a product group, healthcare organisations can select the ones they like individually or as a whole, in a sort of "full LEP version", and acquire a corresponding licence. Based on this platform, custom-tailored implementations are developed for the use of LEP within the given healthcare organisation and for the corresponding software product.

The individual products are available in different language versions – typically in German, French and Italian, and in English in some cases as well.

10.1 The "LEP Documentation and LEP Service Groups" product group

The classification principle for the "LEP Documentation and LEP Service Groups" product group is provided by the LEP classification of services and the occupational groups (see Table 33 unterhalb).

Within the product group, the services are grouped into those with and without case assignment, and form self-contained "building-block" components. Following the building-block principle, the individual products can be supplemented and combined with other LEP building blocks, namely the LEP secondary classifications (see section 2.3, p. 31), with instruments that complement LEP (see section 3, p. 35), and with LEP analyses (see section 4, p. 43).

The individual products in the "LEP Documentation (Doc) and LEP Service Groups (SG)" product group are separated into two distinct editions per occupational group, in order to address the need for different levels of detail (see Table 33 unterhalb).

LEP Classification of Services	with case assignment	without case assignment
LEP Occupational Therapy Doc	✓	✓
LEP Occupational Therapy SG	✓	✓
LEP Nutrition Counselling Doc	✓	✓
LEP Nutrition Counselling SG	✓	✓
LEP Midwives Doc	✓	✓
LEP Midwives SG	✓	✓
LEP Speech Therapy Doc	✓	✓
LEP Speech Therapy SG	✓	✓
LEP Nursing 3 Doc	✓	✓
LEP Nursing 3 SG	✓	✓
LEP Physiotherapy Doc	✓	✓
LEP Physiotherapy SG	✓	✓
LEP Social Services Doc	✓	✓
LEP Social Services SG	✓	✓

Table 33: Products for the LEP classification of services for each occupational group

As seen in Table 33, the individual products are available for seven occupational groups. For each occupational group, an individual product from the LEP classification of services is distributed in either the Documentation (Doc) or SG (Service Groups) edition. As seen in Fig. 42 below, the Documentation edition includes all levels of the classification of services, i.e. up to and including aggregation level 4 (cf. Fig. 8, p. 21).

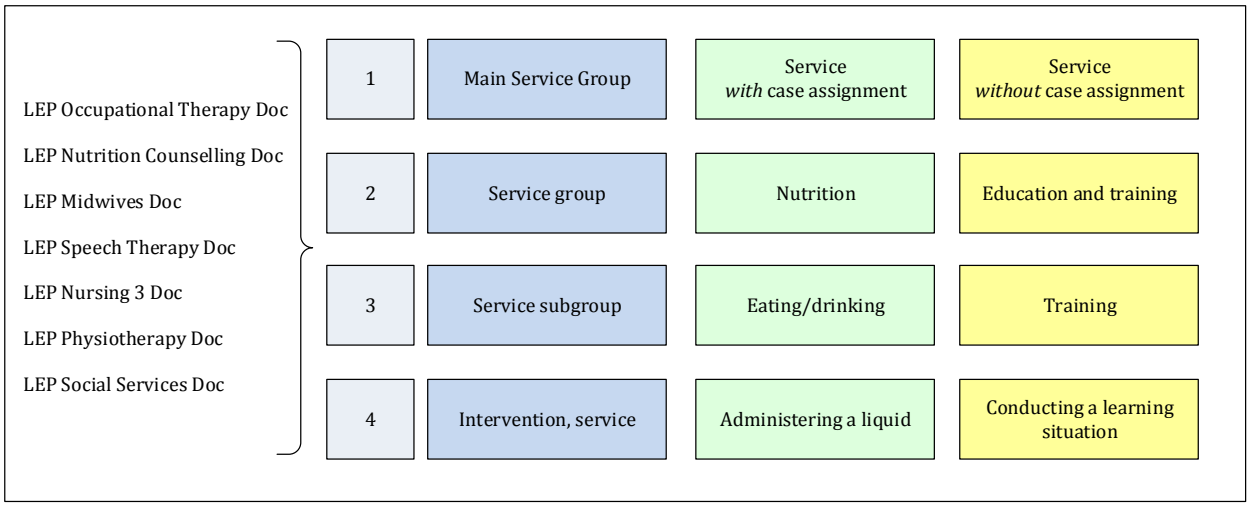


Fig. 42: Documentation (Doc) product for the LEP classification of services for each occupational group

The individual products in the Documentation group, or all of them together, are suitable for *all* LEP applications, in particular for patient documentation (see section 7, p. 85) but also for a service and time recording system that complements patient documentation and also allows for recording at multiple levels (see section 8.3.4, p. 107).

As seen below in Fig. 43, the Service Groups products include the two-level LEP classification of services, i.e. up to and including aggregation level 2 (cf. Fig. 8, p. 21, and Fig. 38, p. 106).

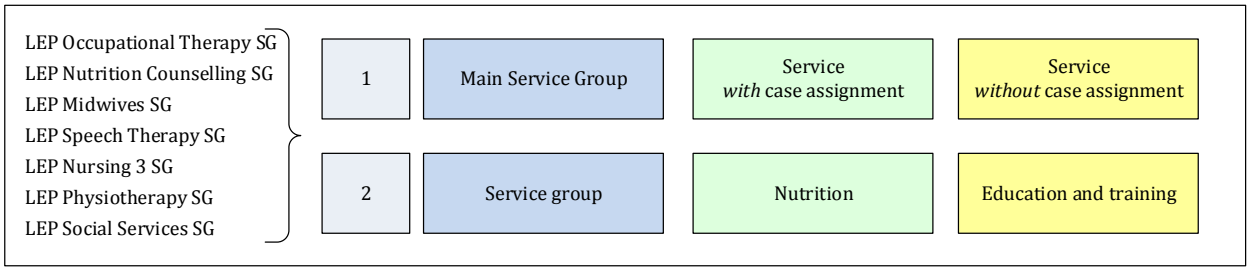


Fig. 43: Service Groups (SG) product for the LEP classification of services for each occupational group

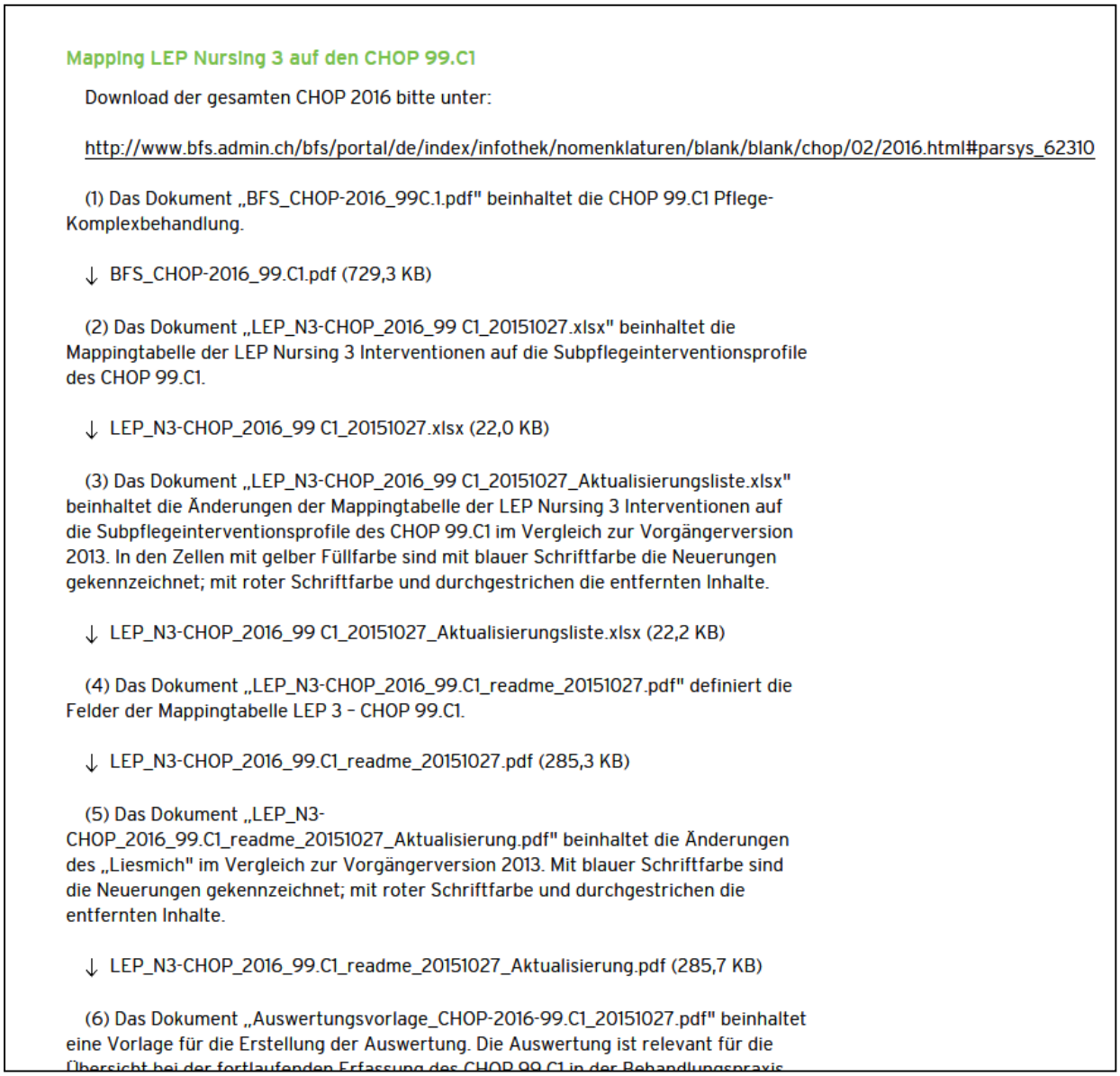
The individual "Service Groups" products, or all of them together, are mainly suitable for a separate service and time recording process (see section 8.2, p. 103), if the emphasis is on ensuring a continuous alignment between service time and net work hours (cf. Fig. 31, p. 81).

10.1.1 Adding LEP secondary classifications

The four LEP secondary classifications – "Organisation-specific addenda", "Case data", "LEP classification of occupations", and "Personnel work time and absences" – are available together under the same licences that are needed for the individual products of the relevant product group (cf. Table 32 on p. 120, Fig. 42 on p. 122, and Fig. 43 oben).

10.1.2 Additions for billing systems

Mappings provide a direct relation between LEP services and the G-DRG and SwissDRG systems (see section 3.3, p. 39). With LEP Nursing 3 versions, DRG revenue-related coding criteria are automatically triggered via CHOP code 99.C1 or via PKMS. The two mapping tables that provide the basis for this mechanism, as well as the necessary documentation, are provided via Web link under the same licence as for the individual product LEP Nursing 3 Doc (cf. Table 33, p. 121); see Fig. 44.



Mapping LEP Nursing 3 auf den CHOP 99.C1

Download der gesamten CHOP 2016 bitte unter:

http://www.bfs.admin.ch/bfs/portal/de/index/infothek/nomenklaturen/blank/blank/chop/02/2016.html#parsys_62310

(1) Das Dokument „BFS_CHOP-2016_99C.1.pdf" beinhaltet die CHOP 99.C1 Pflege-Komplexbehandlung.

↓ BFS_CHOP-2016_99.C1.pdf (729,3 KB)

(2) Das Dokument „LEP_N3-CHOP_2016_99 C1_20151027.xlsx" beinhaltet die Mappingtabelle der LEP Nursing 3 Interventionen auf die Subpflegeinterventionsprofile des CHOP 99.C1.

↓ LEP_N3-CHOP_2016_99 C1_20151027.xlsx (22,0 KB)

(3) Das Dokument „LEP_N3-CHOP_2016_99 C1_20151027_Aktualisierungsliste.xlsx" beinhaltet die Änderungen der Mappingtabelle der LEP Nursing 3 Interventionen auf die Subpflegeinterventionsprofile des CHOP 99.C1 im Vergleich zur Vorgängerversion 2013. In den Zellen mit gelber Füllfarbe sind mit blauer Schriftfarbe die Neuerungen gekennzeichnet; mit roter Schriftfarbe und durchgestrichen die entfernten Inhalte.

↓ LEP_N3-CHOP_2016_99 C1_20151027_Aktualisierungsliste.xlsx (22,2 KB)

(4) Das Dokument „LEP_N3-CHOP_2016_99.C1_readme_20151027.pdf" definiert die Felder der Mappingtabelle LEP 3 – CHOP 99.C1.

↓ LEP_N3-CHOP_2016_99.C1_readme_20151027.pdf (285,3 KB)

(5) Das Dokument „LEP_N3-CHOP_2016_99.C1_readme_20151027_Aktualisierung.pdf" beinhaltet die Änderungen des „Liesmich" im Vergleich zur Vorgängerversion 2013. Mit blauer Schriftfarbe sind die Neuerungen gekennzeichnet; mit roter Schriftfarbe und durchgestrichen die entfernten Inhalte.

↓ LEP_N3-CHOP_2016_99.C1_readme_20151027_Aktualisierung.pdf (285,7 KB)

(6) Das Dokument „Auswertungsvorlage_CHOP-2016-99.C1_20151027.pdf" beinhaltet eine Vorlage für die Erstellung der Auswertung. Die Auswertung ist relevant für die Übersicht bei der fortlaufenden Erfassung des CHOP 99.C1 in der Behandlungspraxis

Fig. 44: Excerpt from the web page for downloading the LEP-CHOP mapping table and documentation

At the time when this LEP documentation was being written, LEP mapping tables for other occupational groups, e.g. for social services, were still in the process of being created.

10.1.3 Adding "subjective evaluation of workload"

With the instrument for the subjective evaluation of workload (SEAB), service providers evaluate their perceived workload (see section 3.4, p. 41). This instrument is available as an additional component under the same licences as for the individual "Documentation" or "Service Groups" products for occupational groups (cf. Fig. 42, p. 122, and Fig. 43, p. 122).

10.1.4 Adding LEP analytics

The two LEP analytics modules, LEP Standard Assessments and LEP Data Comparison (cf. Fig. 17, p. 47) are available as additional components under the same licenses as for the individual products from the "LEP Documentation and LEP Service Groups" product group (cf. Table 32, p. 120; Fig. 42, p. 122; and Fig. 43, p. 122). The licence also includes an Excel-based tool for analyses of services without case assignment, which can be made available to a healthcare organisation for its own use upon request.

10.2 The "LEP Treatment Process" product group

The classification principle for the LEP Treatment Process (compare with Fig. 33, p. 86) is provided by the "LEP Documentation and LEP Service Groups" product group (cf. Table 33, p. 121) and the links between LEP interventions and health statuses (see section 3.2, p. 37, and Fig. 13, p. 38). The LEP Treatment Process should be seen as an interdisciplinary process aimed at providing patient benefit. Creating this process for all occupational groups, e.g. with a uniform set of links between all LEP services with case assignment for the occupational groups with ICF or interdisciplinary issues in SNOMED-CT, will require a long period of discussion and associated development time. The product group currently contains the "LEP Nursing Process", which, as its name implies, is focused on LEP Nursing 3 interventions with case assignment, links and nursing-related health statuses, all from the perspective of the nursing occupational group.

10.2.1 The "LEP Nursing Process" product

LEP Nursing Process is treated as a subgroup within Treatment Process, since it consists of various possibilities for complementing and combining with classification systems relating to health status.

The individual products in LEP Nursing Process are the LEP Nursing 3 classification, the individual partner systems like ePA-AC, NANDA-I diagnoses or AIR Goals, and the individual linkages, e.g. ePA-AC linked with LEP Nursing 3 (see Fig. 45, p. 125).

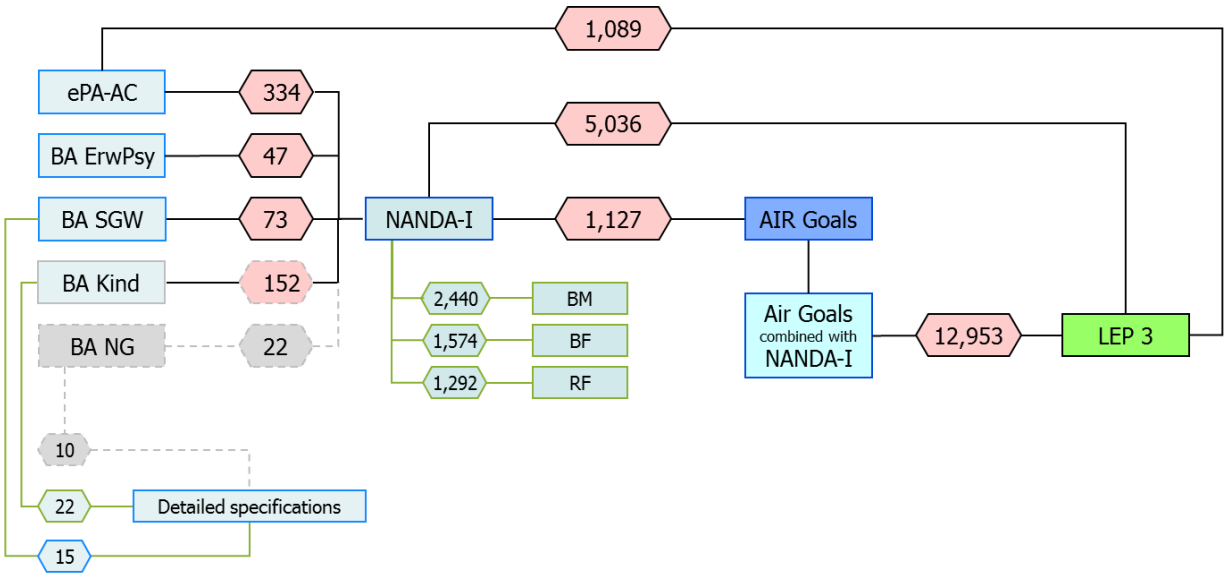


Fig. 45: Classification systems and links between them in LEP Nursing Process

There are direct links between ePA-AC and the LEP Nursing 3 interventions (in the above example with LEP Nursing Process version 3.1, there are 1089 of them). In practice, a healthcare professional making a particular ePA assessment (e.g. "No ability for self-care when eating") will have certain LEP interventions proposed to them for planning and performance in the patient documentation system (e.g. "Administering food"). Depending on how LEP Nursing Process is applied in a healthcare organisation, the LEP Nursing 3 interventions can be used in parallel with the variant described above, for example, or controlled solely via ePA-AC linked with NANDA-I and AIR Goals (cf. Fig. 45 oben).

Within each version of LEP Nursing Process, the individual products are generally delivered in three languages – French, Italian and German – for use under licence (see Table 34 unterhalb). In Switzerland, where all three of these are official languages, this ensures that entries can be made in parallel in all three languages, so that e.g. a German-speaking healthcare professional in the bilingual canton of Valais can switch the treatment plan from French to German. LEP Nursing and individual classification systems like ePA-AC and NANDA-I are also available in English.

Label	Name of individual product
ePA-AC	Results-Oriented Patient Care Assessment (*Ergebnisorientiertes Pflegeassessment*) – Acute Care
BA ErwPsy	*Basisassessment Erwachsene Psychosozial 1.0.0* (Basic Assessment - Adult Psychosocial 1.0.0)
BA SGW	*Basisassessment Schwangere Gebärende Wöchnerin* (Basic Assessment - Pregnant, Birthing, New Mother)

BA Kind	*Basisassessment Kind* (Basic Assessment - Child)
BA NG	*Basisassessment Neugeborenes* (Basic Assessment - Newborn)
NANDA-I	North American Nursing Diagnosis Association. Since 2002, NANDA has been used as a brand name for nursing diagnoses: NANDA International, Inc.
AIR Goals	AHIS (Advanced Healthcare Information Systems) Institut Rosenberger – Nursing goals
AIR Goals, NANDA-I	AHIS Institut Rosenberger – Nursing goals combined with NANDA International nursing diagnoses
LEP Nursing 3	*Leistungserfassung in der Pflege* (Recording Nursing Care Services) - Nursing 3

Table 34: Individual products in LEP Nursing Process

For acquiring content knowledge, another option besides the tables are detailed individual catalogues, e.g. for ePA-AC (Results-Oriented Patient Care Assessment) or for the LEP Nursing 3 classification of nursing interventions (LEP 3). There are also similar catalogues for the 1,089 possible links between these nursing interventions, or for the 5,036 links between the nursing diagnoses in NANDA-I and LEP-3 (cf. Fig. 45, p. 125).

One special feature of LEP Nursing Process is the set of basic assessments *BA Kind*, *BA NG* and *BA SGW* (see Table 34 oben), which come from the "LEPWAUU" project. They were developed in 2008 with the goal of provided interested healthcare organisations working in these areas with transitional solutions so that they could replace them as soon as generally accepted and widely-used assessments became available from third-party providers. Against this background, these basic assessments were intentionally not developed further, although no assessment generally accepted by healthcare organisations has yet managed to establish itself. Due to a lack of demand, the three basic assessments above have *not* been translated into Italian. In addition, two of them, BA NG and BA SGW, are only linked with the nursing diagnoses that were carried over from NANDA-I 2009/2011 into subsequent versions of NANDA-I (cf. Fig. 45, p. 125).

Ten different combinations are available for the use of LEP Nursing Process products under licence (Fig. 46).

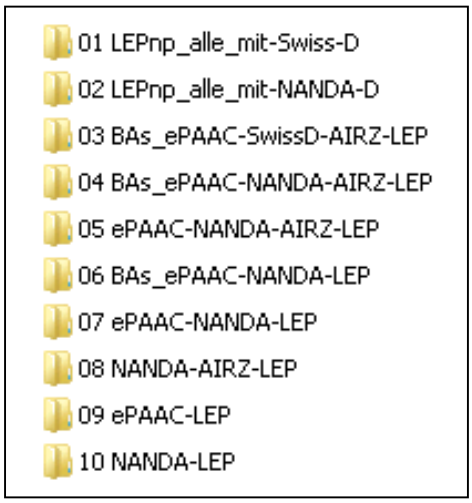


Fig. 46: The ten combinations for use of LEP Nursing Process

The number of healthcare organisations with licences to use LEP Nursing 3 in connection with other classifications and assessment instruments in the nursing process is continuing to grow. At present, about 150 of 250 healthcare organisations in Germany, Austria, Italy and Switzerland use the product (see section 1.2, p. 4). In treatment practice, many different variations of the original "Classic LEPWAUU" (i.e. ePA-AC Basic Assessment LEPWAUU linked with NANDA-I linked with AIR Goals linked with LEP 3) have been successfully implemented in patient documentation (cf. Fig. 45, p. 125, and Fig. 46, p. 127).

At the time when this LEP documentation was being written, *new links* with new classifications were still being developed, such as the links between LEP Nursing 3 and POP Nursing Diagnoses 2.0, ePA-Kids 2.0 ("from 0 years of age"), the nursing diagnoses from the International Classification for Nursing Practice (ICNP) or the "nursing problem list" from SNOMED-CT.

10.2.1.1 LEP Nursing Process LTC

For patient documentation in the field of long-term care, LEP Nursing 3 has been linked with ePA-LTC (Long-Term Care) (Fig. 47).

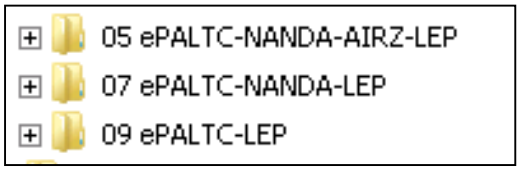


Fig. 47: The three combinations for use of LEP Nursing Process LTC

Two additional combinations are possible for the use of LEP Nursing Process LTC under licence, e.g. with ePA-LTC linked with NANDA-I and LEP Nursing 3. In addition, three nurse specialists have subdivided the LEP Nursing 3 interventions into so-called "mandatory services" ("KVG[30] mandatory services") and "non-mandatory services" (e.g. support, accommodation) with reference to Art. 7 (2)(a-

[30] Health Insurance Act (*Krankenversicherungsgesetz*) (Switzerland)

c) KLV[31] *cf. Table 12, p. 40). This makes it possible to use service data directly from patient documentation for a transparent service-based approach to nursing-care financing in the field of long-term care (Baumberger & Raeburn, 2015).

10.3 The "LEP Special and Individual Products" product group

The last three material LEP product groups are the "LEP Special and Individual Products" (cf, Table 32, p. 120). This product group consists of individual products that complement the other two product groups in order to provide more flexibility of use for statistics and for patient documentation or service and time recording. A separate licence must be acquired for each LEP Individual Product. LEP Special Products are generated under contract from healthcare organisations and are owned by them.

10.3.1 PCAP Suisse

The LEP analytics module PCAP Suisse (see section 4.3.3, p. 52) is an individual product that requires a separate licence.

10.3.2 LEP Special Products

In addition to its own products, LEP generates organisation-specific products under contract from healthcare organisations. For example, lists of organisation-specific nursing diagnoses, and links between assessments, have been prepared for individual hospitals.

10.4 Earlier LEP products

In addition to the current LEP products, there are also older products that are still used in healthcare organisations. Most notable among these are the older LEP generations: LEP Nursing version 2 and LEP Physiotherapy version 1. These are not addressed in this handbook because literature and extensive documentation already exists for them (see literature references in section 11.2, p. 131).

10.5 Selecting LEP products

Which LEP products a healthcare organisation selects is determined by its own particular requirements for the use of LEP. As such, the analyses that the healthcare organisation wants to perform, as well as its goals for patient documentation and service and time recording, are of central importance.

First and foremost, the healthcare organisation's choice of products is determined by "mandatory use" of LEP. This is based in country-specific statutory requirements and financing conditions, e.g. from regulations like the Swiss Health Insurance Act or other healthcare laws, but also from statutory requirements for data protection. For "mandatory use", selecting products involves questions about which data are required for analyses, for patient documentation and for service and time recording.

[31] Patient Care Services Regulation (*Krankenpflege-Leistungsverordnung*) (Switzerland)

The question is thus which data need to be made available, in what degree of completeness, and in what level of detail (Fig. 48).

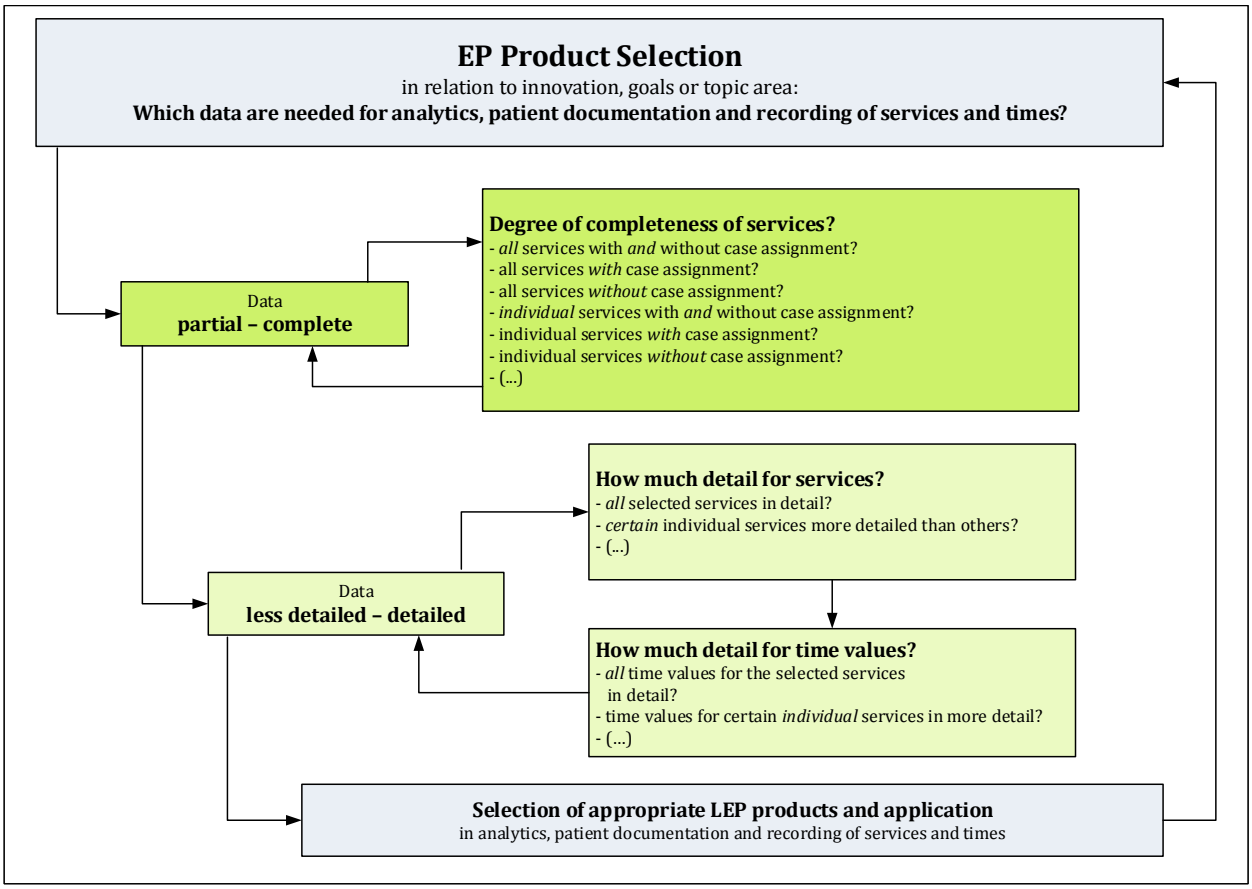


Fig. 48: Questions when selecting LEP products

The healthcare organisation's choice of products is also determined to a significant degree by "optional use" of LEP. This is based in organisation-specific internal guidelines, as well as the innovations, objective and questions of the participating user groups.

Both "mandatory" and "optional" use require a certain volume of service data, a certain level of detail, and the ability to condense and aggregate data, but also a transparent and uniform process (Fig. 48).

The selection of LEP products is influenced by the perspectives of the participating stakeholders, and therefore involves the potential for conflict if certain issues around both "mandatory" and "optional" use are clarified incompletely or not at all.

10.5.1 The LEP matrix structure

A schematic presentation of the LEP classification in a table with rows and columns can be helpful both for selecting products and for improving understanding and technical knowledge about the use of LEP. This type of table is called a matrix structure. The matrix structure in Table 35 (unterhalb) shows the relevant LEP building blocks: the Classification of Services (section 2.2, p. 17), the LEP Secondary Classifications (section 2.3, p. 31), the classifications, instruments and standards that

complement LEP (section 3, “Classifications, instruments and standards that complement LEP” , p. 35) and the LEP Analytics modules (section 4.3, p. 46).

	Occupational groups						
Components	Nursing care	Midwives	Occupational therapy	Speech therapy	Physiotherapy	Social services	Nutrition counselling
LEP documentation	✓	✓	✓	✓	✓	✓	✓
LEP service groups	✓	✓	✓	✓	✓	✓	✓
Services with case assignment	✓	✓	✓	✓	✓	✓	✓
Services without case assignment	✓	✓	✓	✓	✓	✓	✓
Data, complete to partial	✓	✓	✓	✓	✓	✓	✓
Data, aggregated to detailed	✓	✓	✓	✓	✓	✓	✓
Organisation-specific addenda	✓	✓	✓	✓	✓	✓	✓
Case data	✓	✓	✓	✓	✓	✓	✓
LEP Classification of Occupations	✓	✓	✓	✓	✓	✓	✓
Personnel work time and absences	✓	✓	✓	✓	✓	✓	✓
CHOP 99.C1	✓						
PKMS	✓						
Subjective evaluation of workload	✓	✓	✓	✓	✓	✓	✓
LEP Standard Assessments	✓	✓	✓	✓	✓	✓	✓
LEP Data Comparison	✓	✓	✓	✓	✓	✓	✓
PCAP Suisse	✓						
LEP Nursing Process	✓						
LEP Nursing Process LTC	✓						

Table 35: Matrix structure for LEP products

To show the relationships in a simplified way for purposes of product selection and for understanding of how LEP can be used by multiple occupational groups, the individual cells of the matrix can be related to one another.

11 Ongoing development and version management for LEP

The Research and Development division of LEP AG is responsible for ongoing maintenance, quality assurance, development and publication of the LEP classifications, for linking them with other classification systems, and for harmonising them with international standards (see section 3, p. 35). The

goal of ongoing development and version management[32] for LEP is to represent the healthcare organisations' services for patients precisely and appropriately for current circumstances in the healthcare sector, and to keep them up to date. The key to successful application and use is to ensure LEP's usability and appropriateness under constantly changing requirements.

The responsibility for ensuring maintenance and ongoing development of LEP classifications is clearly regulated, and lies with the Research and Development division of LEP AG. The R&D division works in a closely networked way with other stakeholders who are important for development.

11.1 LEP as a learning system

The LEP classifications and the ways in which they are applied, as well as LEP users themselves, can be seen complementary parts of a coherent learning system. Strong, consistent efforts are made to anticipate the changing requirements of the healthcare sector, and ongoing development of LEP specifically target those changing requirements. Results from the latest studies, practical experiences from the use of LEP in healthcare organisations, and recommendations for improvement from the professionals who use LEP are used in a focused way to drive innovation in the development and version management process (see section 11.6, p. 139). For each new version of LEP, the classifications are improved to a greater or lesser degree, with changes and their possible effects – e.g. on the consistency of the classification, its implementation in software, or billing terms – also taken into account.

Anticipating requirements in the healthcare domain is a guiding principle and key orientation of the LEP approach. This approach contributes to innovative development steps, and also to the integration of the latest knowledge into the LEP system and to the ongoing professional development of LEP users and employees. With its innovative contributions, LEP actively participates in developments in the healthcare domain, and helps to ensure that those developments can be implemented in practice.

11.2 The first and second generations of LEP

For the first two generations of LEP, the abbreviation LEP stood for "*Leistungserfassung in der Pflege*" – German for "Recording of Nursing Care Services", in accordance with its intended application (see Fig. 49 unterhalb). Launched in 2006, Generation 3 of LEP is now directly integrated into the treatment process and patient documentation. While LEP is still used as a brand name, the LEP classification of services is used in healthcare organisations is now used for much more than "just" recording services and times.

The first generation of LEP (Fig. 49) was developed from 1988 to 1992 using participatory observation methods, focus group interviews, and ethnographic semantics for the construction of linguistic

[32] Release management.

categories in two hospitals in Switzerland (Maeder, 2000; Maeder, Bamert & Brügger, 1998; Maeder & Brosziewski, 1997; Maeder, Brügger & Bamert, 1999). As part of this process, the St. Gallen Cantonal Hospital with the PAMS[33] workload measurement system (Maeder & Bamert, 1994), and the UHZ with the SEP-UHZ[34] system (Güntert & Maeder, 1994), had been working together closely. The combination of the two systems in 1996 led to the LEP brand name (Fischer, 1997, p. 138).

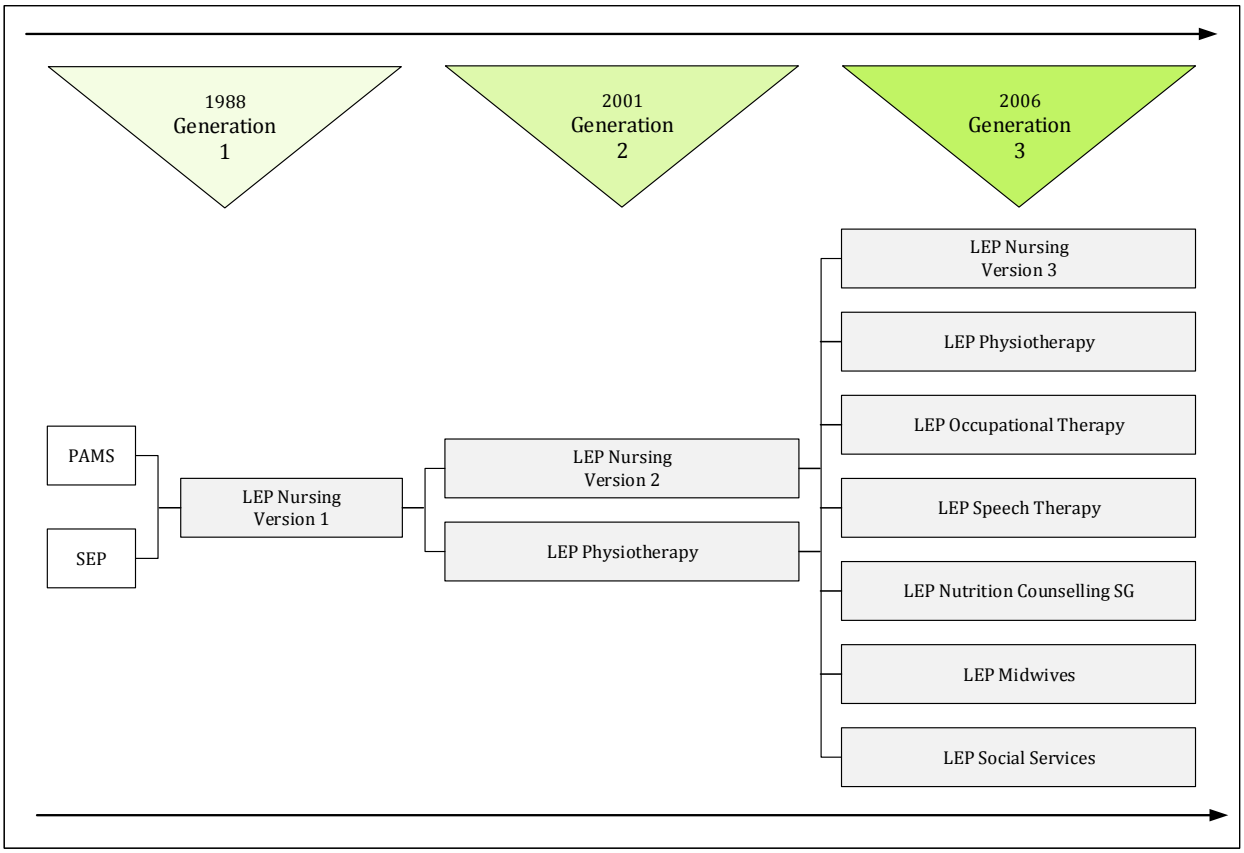


Fig. 49: Three generations of LEP

In the second generation of LEP, the services and time values were further refined (Bamert, 2003; Brosziewski & Brügger, 2001; Brügger et al., 2002b; Brügger & Odermatt, 2001). Besides nursing services, a new service catalogue has been developed for physiotherapy (Maeder, Bamert, Baumberger, Dubach & Kühne, 2006).

The intended application and the construction of the first two generations of LEP are oriented toward use in recording services and times. This recording takes place separately from patient documentation (see section 8.2, p. 103).

In healthcare organisations which are already productively using the second generation of LEP before introduction of the third generation (cf. Fig. 49 oben), there is typically a step-by-step transition from the second generation to the third. In certain healthcare organisations, this process is still under

[33] *Pflegeaufwandmesssystem*, or "Nursing Workload Measurement System".

[34] *System zur Erfassung des Pflegeaufwands* (System for Recording Nursing Workload) at the UHZ.

way. It is not always easy to distinguish the different application objectives of the two LEP generations and their potential feasibility (cf. Fig. 35, p. 101).

11.3 The third and current generation of LEP

In the new, third generation of LEP, the application objectives have changed – despite the continued use of the LEP brand name – under the contextual influence of the increasing technical possibilities for implementing LEP in software applications, and of new fee structures and the orientation of healthcare policy toward eHealth approaches. The application objectives are now focused on use in electronic patient documentation. Due to the structure of the LEP Classification of Services, however, this does not rule out a separate recording of services and times in principle (see section 8.2, p. 103).

The new application objectives influence and change the structure and selection of information for the LEP classification – as would also be the case for any other classification system (see section 2.1, p. 16); Straub, 2009, pp. 63–68). For example, using LEP in patient documentation influences the choice of service types, their structural organisation and their level of detail.

Besides use in electronic patient documentation, the application objectives for the classification in the current LEP generation which have the most significant influence on structure and content are the following:

- semantic and structural interoperability,
- avoiding redundant data and double recording,
- using the same service data in multiple ways,
- integration with the treatment process,
- integration in the healthcare supply chain,
- usability in other healthcare professions,
- extending analyses with additional variables such as health statuses and quality indicators

(Baumberger, 2008; Baumberger, 2014b; Baumberger & Kühne, 2006; Baumberger & Kühne, 2007; Baumberger & Raeburn, 2015; Maeder et al., 2006).

In order to achieve the current LEP application objectives in a sustainable way, the third-generation Classification of Services has been built with a consistent methodological orientation, both structurally and semantically, toward international standards and classifications (Baumberger, 2005a; Baumberger & Dubach, 2006; see section 2.2.5, p. 27, and section 3.1, p. 35).

11.4 Extensions in the third generation of LEP

At the same time when the current generation of LEP first went into productive use in 2006 (Steuer & Rosery, 2006), systematic links with health statuses were established in order to integrate LEP into the treatment process (see section 3.2, p. 37, and Fig. 45, on p. 125). The first link was established as

part of an introductory project for LEP Nursing 3 with ePA-AC (Baumberger & Hunstein, 2009; Steuer & Rosery, 2006). Other links, e.g. with NANDA-I diagnoses or Air Goals, followed and were continuously extended (Baumberger, Buchmann, Gilles, Kuster & Lehmann, 2010; Baumberger & Hunstein, 2009; Baumberger & Kuster, 2011; Chopard, 2010; Gilles, 2010; Hieber, 2014; Kessler, 2012; Kuster et al., 2008; Kuster, 2009b; LEP AG, 2012; Schiefelbein, 2010).

In the current generation, services in occupational therapy, nutrition counselling, midwifery, speech therapy and social services are being added to the existing nursing and physiotherapy services. (cf. Table 33, p. 121, and Table 35, p. 130).

In addition, the services *without* case assignment for all of the above occupational groups are now classified (cf. Fig. 9 on p. 23 and Table 33 on p. 121). As a complement to the services *with* case assignment, they can be useful e.g. in relation to the time spent on services and (net) work hours, but also for content-based analyses of work processes (cf. Fig. 31, p. 81). Time spent on services without case assignment should not be blindly equated with the "C value" concept that was used in the two older LEP generations to represent the difference between "work time and the service time directly attributable to the patient" (Blankart, 2010; Brügger et al., 2002b, pp. 16–17).

11.5 Development network

Ongoing development of the third generation of LEP takes place in close cooperation with certified experts, e.g. with healthcare professionals from clinical practice, management and the sciences, with invoicing partners, professional associations, government authorities, insurers and software developers, and – last but not least – with development teams from other classification systems (Baltzer, Baumberger & Wieteck, 2006; Baumberger et al., 2010; Baumberger & Hunstein, 2009; Baumberger & Kühne, 2008; Baumberger & Kuster, 2011; Bürki Sabbioni, Althaus, Hunstein & Baumberger, 2011; Chopard, 2010; Güttler, 2007; ICN, 2015b; Ranegger, Eberl & Baumberger, 2015; Walzl, 2008).

The following were key sources of subject-matter content for the further development of the third generation of LEP:

- expert suggestions, opinions, criticisms and feedback from
    - LEP end users and LEP reference organisations,
    - subject-matter experts from specific occupational groups/associations, specialist areas and clinical specialisations (e.g. midwives, paediatrics and wound care),
    - experts in other classification systems,
    - billing system experts,
    - experts in research and education;
- results from a variety of semantic mappings and clinical links between LEP and other classification systems;
- results from studies on the concepts underlying healthcare services and workload measurement;
- articles and studies on harmonising classifications in the healthcare sector;
- subject-specific and application-oriented workshops on LEP;
- regional LEP interest groups;
- the vision of the LEP Expert Council.

Behind the development process, we thus find a network of countless individuals whose expertise and clinical experience has contributed to the successful creation and continuing development of the current generation of LEP.

11.5.1 The LEP Expert Council

The LEP Expert Council is made up of prominent experts. It has two missions: It constitutes both a think tank and an expert panel (Fig. 50).

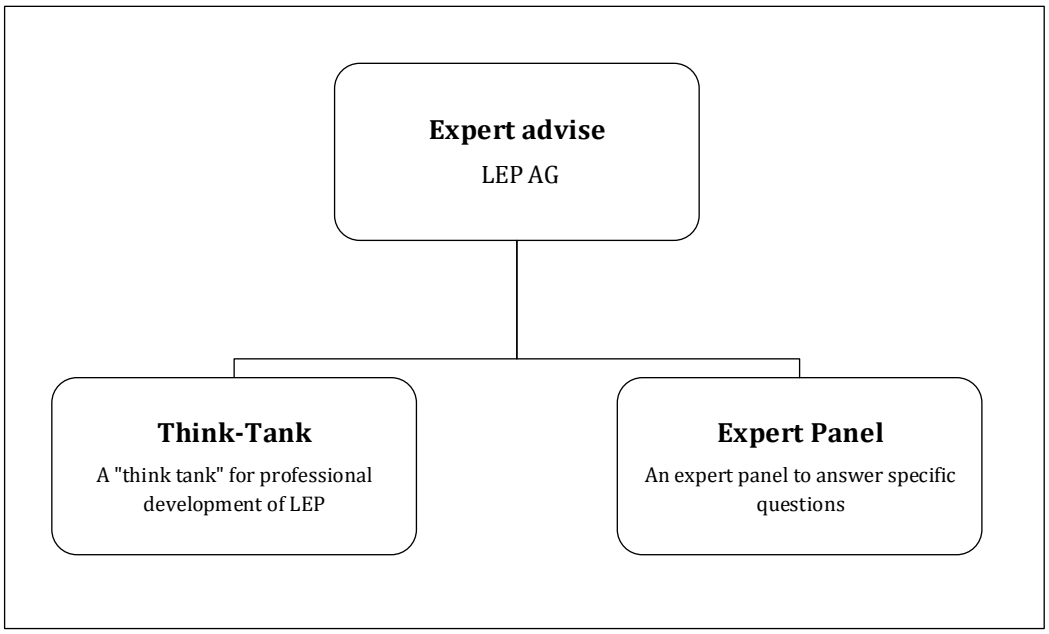


Fig. 50: The LEP Expert Council

The focus for the think tank lies in recognising LEP AG's development needs, and initial approaches to corresponding solutions. The focus for the expert panel lies in answering specific implementation questions (see Fig. 50 oben).

The think tank brings together a variety of different perspectives and is the driver of growth and innovation for LEP AG. It is independent and serves as an "idea factory" for the ongoing development of LEP. It examines technical, political and scientific changes and developments that may be important for LEP AG. Against this background, the think tank determines what actions need to be taken, and offers proposed solutions for the future of LEP. In particular, this task involves a requirement to explain the feasibility of the proposed solutions in as easily comprehensible and practically-oriented a manner as possible, although the proposals do not have to go into detail. The think tank is a meeting place for experts from scientific institutions and from the areas in which LEP is put into practice, e.g. experts from health sciences, health economics and related fields.

The think tank consists of five to eight members. They are invited and compensated by LEP AG. The members remain independent in their thinking, however. The think tank meets once a year for an entire day.

The expert panel uses their expert knowledge to answer specific questions that the Research and Development division of LEP AG has about intended developments. These may include conceptual, methodological and information technology questions. The panel consists of leading experts from the fields of classification systems (e.g. terminologies, classifications) and Clinical Information Systems (e.g. electronic patient documentation, analytics).

The expert panel consists of three to five members. They are invited and compensated by LEP AG in direct connection with the questions to be answered. The members' answers address these questions directly. The members of the expert panel meet twice a year for an entire day.

11.5.2 Scientific LEP sessions

From LEP AG's perspective, there are still gaps and new directions to be explored in research about the use of LEP, the importance of which continues to grow in light of new circumstances in the healthcare sector (eHealth, need for data on patient benefit and quality of treatment, new fee structures based on DRGs).

In the past, prominent conference attendees have gathered for three conferences to address certain central questions: "What kind of research does LEP need?", "Big changes in patient documentation" and "Service and quality". With these events, LEP aims to reinforce the process of scientific analysis of LEP and help it to progress. Each of the questions are addressed from a variety of perspectives, e.g. from the perspective of clinical practice, health economy, science and statistics. Questions about the validity and reliability of LEP, but also about the contexts in which LEP is used or about measuring the quality of nursing services, are addressed and discussed.

These sessions provide a rough sketch of the LEP research agenda and contribute to work in the ongoing development of LEP.

11.5.3 Establishing the validity of LEP content

One focus of current development efforts involves the validity of LEP's content with regard to healthcare interventions (Burns & Grove, 2010, pp. 334–335; Polit & Beck, 2012, pp. 336–342).

11.5.3.1 Feedback from clinical practice

To provide prompt and continuous improvement of the validity and completeness (exhaustiveness) of the classification's content, a system is in place to gather feedback from clinical practice. "Otherwise specified" services play a central role in this system for ensuring the content validity of LEP services (see section 2.2.4.5.1, p. 25). Through this method, over 50 suggestions have already contributed to the construction and classification of new healthcare interventions, and have been used to add increased precision and differentiation to existing interventions, e.g. by splitting them into multiple interventions.

These suggestions typically come directly from people using LEP in their day-to-day practice. They confirm LEP's suitability for practical use in the approximately 250 healthcare facilities, and contribute substantially to the ongoing development of LEP's content with their detailed and context-specific suggestions for improvement. This "semi-open-source" approach contributes to a high degree of user acceptance, and integrates the latest clinical know-how. Needless to say, these suggestions are not simply added to the LEP classifications "on demand", but are systematically reviewed and processed. The suggestions are standardised with reference to structural and semantic standards (see section 3.1, p. 35), and integrated into the LEP classification in parallel, with a critical eye to ensuring the consistency of that classification.

11.5.3.2 Consistency with standards and other classification systems

In addition to the feedback system, LEP's adherence to international standards is also relevant for the validity of its content; the semantic mapping to ICNP (Baumberger et al., 2015) and SNOMED CT (Baumberger, 2016) are particularly relevant with regard to interoperability. The mapping of LEP to ICNP shows that LEP uses a high proportion of terms similar to and synonymous with those of ICNP to describe nursing interventions. Fully 523 of 536 LEP nursing interventions (97.6%) could be mapped to ICNP (Baumberger, 2015a). In turn, the ICNP interventions are already mapped to SNOMED CT (ICN, 2015a), so we can assume a high level of coverage between LEP interventions and SNOMED CT (Baumberger, 2016).

The construction of LEP following ISO 18104 is relevant to the structure of the semantic terms (see section 2.2.3, p. 21; ISO, 2014, pp. 9–13). INCP also uses this structure (ICN, 2008). As such, both LEP and ICNP represent pre-coordinated classification systems at the level of nursing interventions. In

addition to semantic correspondences, the mapping can be used to review whether the structure (ISO) and composition of terms and concepts for LEP interventions are valid in terms of their content with regard to the description of nursing interventions according to international standards (ISO). To a large extent, this is in fact the case; for the two structural elements that must be defined for nursing interventions according to the ISO RTM, namely "Action" and "Target", the LEP Nursing 3 interventions complied with the requirement with a single exception, "Travel time for external evaluation" (Baumberger et al., 2012). This exception was removed in the next LEP version update.

Based on the results described above, and additional results from other LEP mappings (Güttler, 2007; Müller et al., 2006; Ranegger et al., 2015; Walzl, 2008), the content validity of the LEP Classification of Services can continue to be reinforced.

We also note here that, thanks to the development by expert groups of links between LEP and assessments and diagnoses, gaps in the LEP Classification of Services have been identified and resolved with a focus on health statuses.

11.5.3.3 Expert groups

The initial and ongoing development of parts of the LEP Classification of Services are handled by expert groups. These groups also develop LEP links and mappings with other classification systems. This ensures that LEP products are always based on expert validity as well, an important part of content validity (Burns & Grove, 2010, pp. 334–335; Polit & Beck, 2012, pp. 336–342). Successful examples of such expert groups include the "PCAP Suisse Working Group" (see section 10.3.1, p. 128), with members from healthcare organisations and LEP AG, or the former "LEPWAUU Project Group" (Kuster, 2009a, Kuster, 2009b), which was transformed into the current "LEP Treatment Process Working Group" and creates links between individual classification systems (see section 3.2, p. 37, or Fig. 45, p. 125). Another example is the "DRG and MTT Working Group" in the Swiss canton of St. Gallen, consisting of members from various healthcare professions and from LEP AG. This group developed the LEP service classifications for occupational therapy, speech therapy and physiotherapy (DRG and MTT Working Group of the canton of St. Gallen, 2010). The LEP service classification for midwives, on the other hand, was developed by another working group in collaboration with LEP AG (Stocker, Stadler, Krähenbühl& Baumberger, 2012). The Health Department of the Bern University of Applied Sciences also refined certain individual interventions later under contract.

11.5.3.4 Workshops with user groups

LEP workshops are events at which LEP users focus intensively for a limited time on a specialised topic relating to LEP. LEP user groups meet with the objective of putting LEP into practice as successfully as possible, and of contributing actively and in innovative ways to its ongoing development. They are made up of experienced LEP users from healthcare organisations and employees of the LEP Research and Development division. Workshop members meet regularly each year to discuss specific

LEP applications and specialised content, analyse problems with its use, identify the approaches that have yielded the most successful solutions in practice (best practices), and identify concrete proposals and innovations to improve the LEP classifications. These workshops are conducted by means of brief presentations from each participant, e.g. about the practical contexts of current challenges and successful solutions.

11.5.4 Specialist conferences and training

Employees of LEP AG regularly give presentations at specialist conferences where they maintain their professional contacts and networks, e.g. at conferences focusing on classification systems and terminologies, at management forums, conferences for IT in the healthcare sector, occupational group meetings, DRG forums or eHealth-related meetings.

11.6 Release management

LEP's release management process handles the development and versioning of the different LEP products. It includes planning, the acceptance procedure for foreign-language translations and rests, and the final publication of new versions, as well as:

- the LEP Classification of Services (cf. Table 36 unterhalb, including Nursing 3, Midwives, Social Services).
- the LEP Treatment Process, including links e.g. ePA-AC with LEP Nursing 3 in the LEP Nursing Process.
- mappings of LEP to other relevant systems (cf. Table 37, p. 141, including SNOMED CT, ICNP, OPS/PKMS, CHOP).

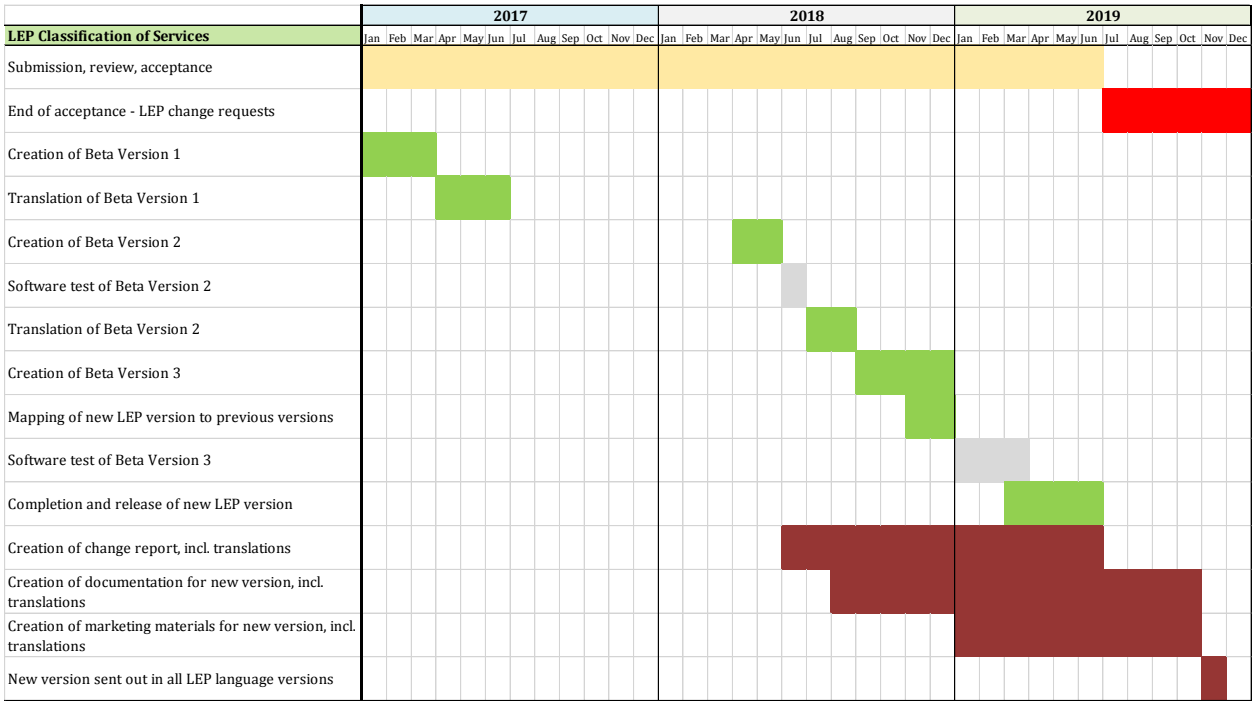


Table 36: LEP release management – example with Classification of Services

The goal of LEP release management is to manage different versions in a comprehensible way, and to provide a sound basis for planning by healthcare organisations and the software partners who work with LEP. It ensures that new LEP versions are prepared and released on time. In addition to the scheduled release of new versions, the times specified for the acceptance and testing of partner systems like ePA-AC or NANDA-I, prior to their linkage to LEP Nursing 3 in the nursing process, are also binding.

For each new LEP version, the changes (such as any LEP interventions that have been modified, added or suspended) are systematically coded and fully documented. This makes it easy to see what has changed, when, and in what ways. Earlier versions remain available if necessary, e.g. if needed to compare analyses over a period of 10 years or more.

Each release cycle is three years long (cf. Fig. 1, p. 3). The first cycle runs from 1 January 2017 to 31 December 2019. In the version development process, the new version being created goes through a series of development steps. Depending on the size and scope of the new version, certain tasks are skipped or reduced. The release of the new version marks a kind of “end state”. The release cycle starts over smoothly with a transition to work on the next LEP versions. The process of managing and implementing changes to existing LEP products continues, ultimately leading to a new LEP version package.

The release cycle includes tests of beta versions (incomplete versions). The final release of a version for integration into the software takes place six months before its publication (see Table 37 unterhalb, example of June 2019).

The mappings of LEP to billing systems represent an exception to the usual timing of the release cycle. Here, the new versions come out on a yearly basis, since new revenue-related versions are also published yearly in the SwissDRG and G-DRG system (cf. Table 37).

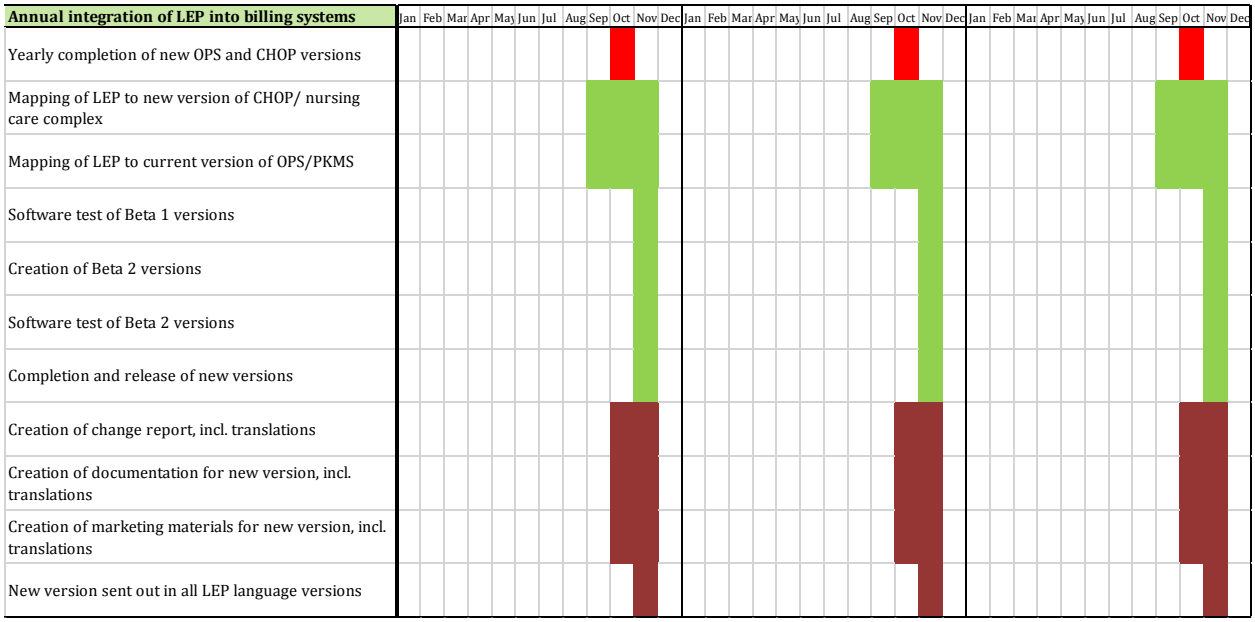


Table 37: LEP release management – example of LEP mappings to OPS and CHOP

New LEP products, such as the "LEP Classification of Professions" or a link between POP nursing diagnoses or ePA-Kids and LEP Nursing 3, are considered as new developments. The initial development of a new LEP product is complete when the first version (Version 1) is available. It is then incorporated into the LEP release cycle.

12 Training, consulting and contact

Services like consulting and training are "immaterial" LEP products. Through their connection to hands-on practice, they convey the theoretical knowledge and practical know-how needed to apply LEP and put it to efficient use. The range of topics for LEP training or consulting includes the following services (cf. Fig. 51 unterhalb):

- Support for users in implementing LEP and putting it to practical use in healthcare organisations;
- Support for correctly implementing LEP in a software application and aligning it with a healthcare organisation's requirements, e.g. implementation in patient documentation or in service and time recording (see section 5.12, p. 72);
- Support for LEP data management in the IT system, e.g. support for interfaces in IT systems between patient documentation, finance and billing system, personnel management system and analytics (cf. Fig. 25, p. 71);
- Subject-matter knowledge and practical know-how for working with LEP analytics, LEP classifications and the LEP treatment process, and the connections between them;

- Subject-matter knowledge and practical know-how for working with patient documentation and service and time recording, e.g. organisation-specific implementation of guidelines (see section 7.4, p. 95, and section 8.4, p. 110);
- Support in planning and execution of LEP analytics: Statistics, data collection, analyses and interpretation, e.g. for scientific or business-related questions or for questions relating to the quality of treatment (cf. section 4, p. 43);
- Support for the creation of organisation-specific reporting of LEP analytics, e.g. for department or unit managers, finance departments and upper management (see section 4.2, p. 45).

The wide variety of training and consulting options are due to the flexibility with which LEP can be used. Therefore, a detailed and systematic clarification of each healthcare organisation's objectives is always the first step. Depending on those objectives, the appropriate approach, the consulting or training option and the corresponding methods and contents are determined, as exemplified in the initial overview in Fig. 51 unterhalb.

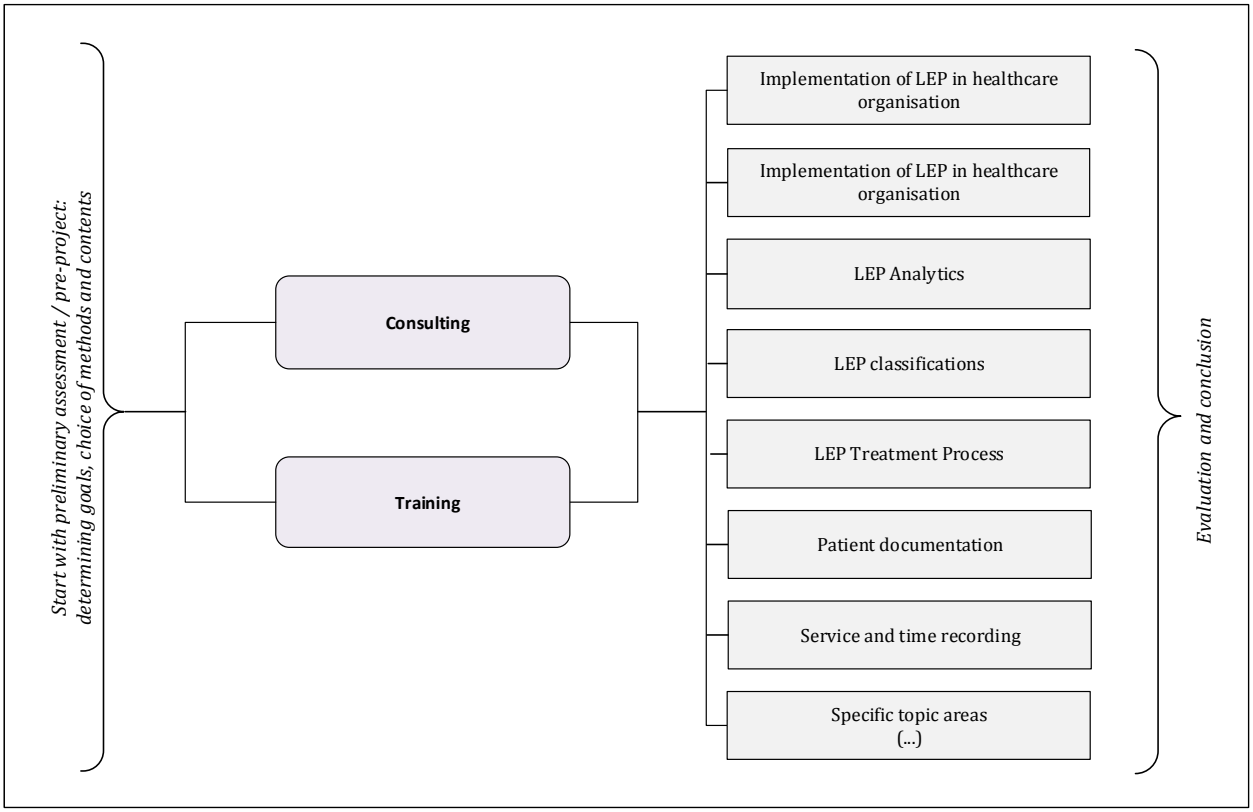


Fig. 51: Overview of training and consulting from LEP AG

The following section presents an example of LEP AG's training and consulting offerings in connection with the initial deployment of LEP and the three LEP components for analytics, patient documentation and service and time recording (cf. Fig. 2, p. 5, and Fig. 3, p. 6).

12.1 LEP training and consulting for deployment of LEP

In deployment projects, LEP is adapted to the healthcare organisation's requirements, and integrated into the software application in the existing IT system in which LEP will be used (cf. Fig. 51 oben; see also Fig. 25 on p. 71). The focus here in on the analyses that the healthcare organisation wants to perform, and the associated requirements for the patient documentation and service and time recording components. This can be seen as an iterative process, i.e. one that gradually achieves a closer and closer fit to the target requirements and the healthcare organisation's software solution through a repeating process. Ideally, there should be a kick-off meeting in which LEP AG as the content advisor, the software company, and the healthcare facility all participate. Topics may include analytics with LEP, patient documentation and service and time recording, implementation in the software, or questions about interface management. Additional training sequences are also scheduled at kick-off meetings, and their content is discussed. A training and consulting offering for LEP deployment projects may focus on topics like the following:

- In a pre-project phase (see Fig. 51 oben): Potential uses of an LEP application, limits of the application, objectives for the use of LEP, specifications for the LEP application, training programme
- In the project itself: Integration of LEP into the software, launch support, user training (project management, key users, end users, etc.)
- Follow-up – refreshing and expanding on what has been learned Support customisation, specific user training sessions

12.2 Training and consulting for LEP Treatment Process

The goal of such training and consulting efforts is to integrate the use of LEP Treatment Process into a healthcare organisation's daily management and treatment routines. This integration process is adapted to reflect the analyses that the organisation wishes to perform, and its use of service and time recording in LEP, if applicable.

In a pre-project phase (see Fig. 51, p. 142), it can be helpful to examine the following factors as part of the needs analysis:

- Identifying and defining the goals of electronic patient documentation
- Fine-tuning to align with service and time recording and analytics
- State of implementation of electronic patient documentation
- State of knowledge and practical implementation of the treatment process
- State of knowledge and practical implementation of individual modules such as assessment, diagnoses, goals, measures or outcomes
- Incorporation of healthcare interventions from the LEP Classification of Services into the front and/or back end of a patient documentation system, e.g. midwife interventions or LEP nursing interventions

- Organisation-specific requirements for the LEP Classification of Services, for the use of aggregated services (see section 8.3, p. 104) and/or for the reorganisation of LEP services (see section 7.3.3, p. 93)
- Requirements for links with LEP services within and outside of the treatment process, e.g. with health statuses or billing systems
- Requirements for documentation quality and data quality based on the desired analyses (see section 6, p. 74, and Table 29 on p. 99)
- The organisation's staff resources, especially experts from specific occupational groups and/or IT staff

Within a project, and based on a needs analysis in the pre-project phase, the goal of training and consulting may be for users to recognise the importance of documenting the treatment process, and to acquire subject-matter knowledge and practical know-how (Jäckle, 2009; Kruse, 2004; Wiater, 2007) for individual process steps like assessment, diagnosis, goal, LEP healthcare intervention and outcome. An additional goal may be correct recording of services and times based on guidelines adapted for the given healthcare organisation (see section 8.4, p. 110), if such recording is to be carried out to supplement electronic patient documentation or as a separate process.

Process steps specific to particular occupational groups, e.g. in the midwifery or nursing process, are targeted with focused training sessions. The potential subject-matter content in a training session, e.g. for the application of LEP Nursing Process, might include the following:

- Assessments, e.g. ePA–CC
- Nursing diagnoses, e.g. NANDA-I
- Nursing goals, e.g. Air Goals
- LEP Nursing 3 in patient documentation
- LEP Nursing 3 in service and time recording to supplement patient documentation
- Special LEP service types (organisation-specific, otherwise specified, etc.)
- LEP default time values
- Level of detail and completeness of interventions
- Links with the treatment process

In a follow-up meeting, the people from management, support and treatment processes who are involved with the use of LEP Treatment Process meet to discuss the current state of the project. Questions like the following can be systematically evaluated:

- How well have patient documentation and LEP Treatment Process been integrated in the treatment process?
- How is the reporting system working with regard to the desired scope and level of detail of LEP data in patient documentation?
- Based on a data analysis, what shortcomings can be identified in patient documentation?
- How can shortcomings in the patient documentation be resolved?

12.3 Training and consulting for service and time recording

The goal of training and consulting in this area is to integrate the use of service and time recording into an organisation's operational processes, in line with the desired analytics and electronic patient documentation with LEP.

In a pre-project phase (see Fig. 51, p. 142), it can be helpful to examine the following factors as part of the needs analysis:

- Identifying and defining the goals of service and time recording
- Fine-tuning to align with electronic patient documentation and analytics
- State of implementation of service and time recording
- State of knowledge and practical implementation of the service and time recording process
- Organisation-specific requirements for service and time recording with regard to personnel work time (see section 6.3, p. 80)
- Organisation-specific requirements for the recording of service and time values with and/or without case assignment, and for the level of detail recorded for services (see section 6.2, p. 79)
- Requirements for data quality in service and time recording, based on the desired analyses (see section 6, p. 74, and Table 30 on p. 114)
- The organisation's staff resources, especially with regard to the presence of nurse specialists and/or nursing IT staff

Within a project, and based on a needs analysis in the pre-project phase, the goal of training and consulting may be for uses to recognise the importance of service and time recording, and to acquire subject-matter knowledge about the ability to record data at different levels of aggregation, and about different service times and default time values.

An additional goal might be correct patient documentation (see section 7.4, p. 95), if service and time recording is intended to complement patient documentation.

The following content might be discussed in a training for service and time recording with LEP:

- Healthcare interventions in service and time recording to supplement patient documentation

- Special LEP service types (organisation-specific, otherwise specified, etc.)
- LEP default time values
- Level of detail and completeness of services
- Alignment with personnel work time

In a follow-up meeting, the people from management, support and treatment process who are involved with service and time recording with LEP meet to discuss the current state of the project. At this meeting, questions like the following can be systematically evaluated:

- How well has service and time recording with LEP been integrated into operational processes?
- How is the reporting system working with regard to the desired scope and level of detail of LEP data in service and time recording?
- Based on a data analysis, what shortcomings can be identified in service and time recording?
- How can shortcomings in service and time recording be resolved?

12.4 Training and consulting for LEP Analytics

The goal is to integrate LEP Analytics into operational processes, in line with electronic patient documentation and with service and time recording in LEP.

The training and consulting offerings for LEP Analytics (cf. Fig. 51, p. 142) focus on data collection, data analysis, results and interpretation, and on data-driven implementation of change management measures. They are based on the LEP basic data and the three LEP analytics modules (cf. Fig. 17, p. 47). Major topics of discussion might include:

- Identifying and defining the goals of analytics
- Fine-tuning to align with electronic patient documentation and service and time recording
- Data collection from patient documentation, service and time recording, and combinations of these
- Data analysis, e.g. explanatory variables, target variables, choice of methods, aggregation, measures of dispersion, tables and graphs
- Results and interpretation, e.g. irregularities, outliers, feedback and reporting
- Change management, e.g. data-driven decision support, setting objectives, implementation, test measurements, communication, conclusion

12.4.1 Consulting for special analyses with LEP

LEP offers custom-tailored statistical consulting for LEP healthcare organisations to address organisation-specific and complex analytic issues (cf. Fig. 51, p. 142). For example, this may include areas like the following:

- Task clarification based on an exchange of information about the conception and purpose of the desired analysis

- Determination as to whether a particular question can be answered with standardised LEP basic data
- Advice in selecting a suitable statistical method
- Advice in selecting an appropriate computer program
- Advice in selecting the data analysis method
- Advice for the interpretation of results and indicators.
- Reuse of restricted analyses

This type of consulting requires a clearly defined question, and the ability to provide a preliminary look at the healthcare organisation's data. If the data quality does not meet the specifications required by the LEP analytics modules, or if an organisation-specific question requires overly complex links with other data sources, no consulting can be provided. We recommend that you contact us when you first begin planning for special analyses.

12.5 Training and consulting for specific issues

As the name implies, these types of training and consulting sessions focus on specific issues. The goal is to address each question in a way that reflects the specific characteristics of the healthcare organisation's LEP application. Specific questions can lead to special analyses (as sketched in 12.4.1 oben), or may include them as part of the discussion.

For example, the focus may be on questions like the following:

- Using LEP for best practices
- Standard productivity for time spent on services with case assignment
- Linking patient documentation with knowledge management
- Determining action-related quality indicators
- Fine-tuning between organisation-specific assessment or classification systems with LEP as part of treatment processes
- Triggering organisation-specific revenue factors within DRG systems
- Employees' satisfaction with their work as part of operational health management
- Managing absences and missed hours
- Optimum use of staff within the treatment team
- Preparing and presenting specific topic areas

This type of training or consulting requires a clearly delimited topic area. It may also be helpful to establish restrictions in advance on the amount of time and effort to be spent on the consulting and training process. For certain issues, LEP can also draw on experts from its network.

12.6 Answers to frequently asked questions about LEP

The answers to frequently asked questions (FAQ) published on LEP's website help LEP healthcare organisations to set up LEP and put it to use in practice. LEP keeps users informed of newly added or

modified answers on the FAQ page through the “News” section of its website and through the newsletter.

Each answer starts with a note about which version(s) of LEP the answer applies to. If no such indication is present, then the answer is version-independent.

LEP sometimes provides FAQ histories here, i.e. by updating the answers according to different historical classification versions. However, this is only necessary when an LEP primary code discussed in a FAQ changes from one version to another. In this case, multiple answers are provided for a single FAQ: The currently valid answer is shown first, and earlier versions appear below it.

12.7 LEP user conferences

The annual user meetings are forums for professional and social interactions between LEP AG and its customers. There is always a lively exchange of ideas within the LEP community. In the spirit of mutual dialogue, currently relevant topics relating to LEP are discussed for a full day. Information is provided about the latest LEP products, the current state of LEP version update efforts (see section 11.6, p. 139), and trends that affect the use and ongoing development of LEP. Questions and suggestions about needs and about the use of LEP products are examined and discussed. The detailed agenda for these events can be viewed on our home page.

12.8 LEP software sessions

Taking inspiration for their content and methods from the LEP user conferences, annual meetings are also held between LEP AG and its software partners. In addition to an exchange of information and experience, requirements for implementing LEP products in software are examined and discussed. The detailed agenda for these events can be viewed on our home page.

12.9 Regional LEP user meetings

LEP users from different healthcare organisations meet in regional interest groups several times per year, independently of LEP AG. Interested users started holding these meetings with the goal of maintaining regular contact, discussions and networking. Current user questions are also discussed at these meetings, presentations are organised on currently relevant topics, and participants provide support for each other’s challenges.

12.10 Contact and information

Visit https://www.lep.ch/en/why-lep.html for important information on LEP products, as well as general background information.

LEP publishes a regular newsletter about updates to LEP. To learn more about LEP publications, write to us at: info@lep.ch

Further details about LEP products and services offered by LEP AG are available upon request. We're always happy to lend a hand.

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Glossary

In the LEP documentation, the following terms are used with the definitions provided here.	
Term	Definition
Aggregation	Grouping of variables or data with detailed definitions into categories of variables or data with more general definitions, e.g. grouping LEP healthcare interventions into LEP service groups (see also: classification).
Software specification criteria	LEP is not a software application. LEP should be implemented in a software system in such a way as to provide user-friendly support for all stages of the treatment process and the support and management processes, while minimising documentation and recording efforts. To assess this, mandatory and optional criteria are defined. The implementation of LEP in software systems, the specification criteria, and the evaluation procedure are described in detail in a separate document.
Work hours, gross	The amount of time that is available to a healthcare professional for the provision of services, including break times and paid absences provided for in the employment contract (see also: Work hours, net).

Work hours, net	The amount of time during which a healthcare professional is actually available to provide services, excluding break times and paid absences provided for in the employment contract (net service period). For example, if work started at 8:00 on a given day and ended at 16:30, and assuming a 45-minute break, the net work hours for that day would be 7 hours and 45 minutes. It is important to include any overtime or shortfalls in the calculation. The net work hours for healthcare professionals is often compared with the time spent on services with and without case assignment (see also: Standard productivity, case-oriented and allowance time) (cf. Frodl, 2011, p. 67; Ganz, 2014; Naegler, 2015; Wabro et al., 2010, VII; Wipp et al., 2012, p. 10).
Treatment	Includes the services of a healthcare professional that contribute to a patient's care or recovery, or to the prevention, early detection, diagnosis or relief of an illness (see also: Service, with case assignment) (FOPH, 2015, p. 2).
Organisation-specific addenda	With the LEP secondary classifications for organisation-specific addenda, a healthcare organisation can document, record, save and analyse healthcare services and information that it defines and formalises separately in accordance with its own specific needs. This may be for legal reasons ("Closing door" or "Raising bed barrier rails"), or for instructions and behavioural guidelines ("Active listening", "Proposing a conversation" or "Showing interest in the patient"). Only after consultation with LEP should organisation-specific services or information be used to compensate for services missing from the LEP classification. Caution: They must not be confused with "Otherwise specified services" (see also: Service, otherwise specified).
Training environment, structured	Represents the framework for services that are performed in connection with teaching and learning at training events (courses, seminars). In general, these are services without case assignment, e.g. "Implementing/organising internal continuing training" or "Participating in internal advanced training" (cf. Besson, 2013, 65, pp. 227–228).

Training environment, unstructured	Represents the framework for services that are performed in connection with teaching and learning during work processes. These may be services with or without case assignment, e.g. "Conducting a learning situation" or "Guiding/instructing employee" in direct interaction with a patient (see also: Service, coupled services) (cf. Besson, 2013, 65, pp. 227–228).
Coding	The act of encoding (LEP) data. When coding, all signs from a given set of signs, e.g. LEP service terms ("Providing movement training") are assigned to another set of signs, e.g. the LEP content numbers (IID, "I_22521"). Another example is the coding of LEP content numbers into LEP structure numbers (SID, "1.3.1.2").
Default time value	A default recommendation for an LEP service time value based on data analyses, e.g. 5 minutes for "Lateral positioning". For documentation and recording purposes, it serves as a reasonable "initial value" that can be changed to match a specific situation and that is used for analyses – whether or not it is changed. The difference compared to a traditional, normative time value or reference time value is that the time value can be changed, and thus regulated by the healthcare organisation.
eHealth	Electronic healthcare services with integrated use of information and communication technologies to structure, support and interconnect all processes and actors in the healthcare sector (cf. FOPH, 2007, p. 2; 12-13; EU, 2012, p. 3; WHO, 2005, p. 109).
Evaluation of workload, subjective (SEAB)	The service provider's evaluation of the workload for a given work period (e.g. shift; workload in hours) on a scale from 1 to 7.
Case data, LEP	Data on the patient and the context of service activity, e.g. age, type of stay, change in circumstances. To systematise these data, the LEP secondary classification "Case Data" is used.
Healthcare professions	Professions based in the healthcare system which provide healthcare services to the population. Healthcare professions are classified in the LEP classification of occupations based on their specialisation and level of education (cf. FOPH, 2016).

Healthcare organisations	Healthcare facilities, institutions, operations.
Healthcare professional	Practitioners of healthcare professions, e.g. doctors, midwives, occupational therapists, speech therapists, physiotherapists, registered nurses or social workers who provide or order services within the treatment chain.
Healthcare intervention	An action that is taken on behalf of a person or the general populace in order to evaluate health, functions or states of health, and to modify or improve them (WHO-FIC Family Development Committee, 2012, p. 6). Healthcare interventions are services with case assignment on the 4th aggregation level of the LEP classification of services, which are performed "with", "on" or "for" a person as part of the treatment and nursing process. They are divided into direct and indirect healthcare interventions. It is important not to confuse indirect interventions and individual services without case assignment on the 4th aggregation level.
Healthcare intervention, direct	An action performed "with" or "on" a person with a need for healthcare interventions as part of the treatment and nursing process, e.g. "Administering a liquid", "Dispensing childbirth advice" or "Intravenously administering an injection" (cf. Dussault, 2011; Morris et al., 2007; Sovie & Smith, 1986).
Healthcare intervention, indirect	An action performed "for" a person with a need for healthcare interventions as part of the treatment and nursing process, e.g. "Maintaining patient documentation", "Organising patient appointment" or "Compiling documentation for service remuneration providers" (cf. Dussault, 2011; Morris et al., 2007; Sovie & Smith, 1986).
Healthcare status	The state (level, degree) of health of an individual, group or population, assessed and defined subjectively by the individual or by means of 'objectivisable' measurements performed by healthcare professionals, e.g. assessments, diagnoses or patient outcomes (NLM, 2016b; WHO, 1946). Also a cover term for activities, participation, modes of behaviour, body structures and functions, and health-related contextual factors (WHO, 2010).

Interoperability	The ability of (computer) systems or (software) products to communicate with one another. In particular, this includes the ability to exchange data between two or more systems, or for different programs to use the same data formats and protocols. The goal is to be able to exchange information with as little loss of information and as little effort as possible (cf. Bointner, 2008, p. 5).
Interoperability, semantic	Content interoperability ensures that the meaning of the exchanged information can be understood. It requires that the terms which are exchanged be defined in such a way that they can be interpreted correctly and unambiguously (eHealth Suisse, 2016).
Interoperability, structural	Syntactic interoperability ensures that the data to be exchanged are compatible, so that they can be processed in the systems in a technically correct manner. The locus of syntactic interoperability is information structure, e.g. the structure of a service term or an electronic discharge report (eHealth Suisse, 2016; ISO, 2014).
Indicator	A characteristic, absolute numeric value or a characteristic ratio that provides stakeholders in the healthcare sector with an indication of where the effectiveness and efficiency of the services provided by healthcare organisations, as well as their service processes and structures, are favourable, and where there is a need to make changes. Example: Subjective evaluation of workload is a soft indicator, while the standard productivity of a healthcare organisation is a hard indicator. Interpreting a combination of indicators provides a more comprehensive basis for decision-making processes around the question of how successful a given healthcare organisation's service activity is. LEP data for indicators should ideally be (1) collectible with a reasonable amount of effort, (2) clearly and easily interpretable, and (3) subject to influence by concrete measures. Data already present in other systems, e.g. in the finance and billing system, the administration system or the personnel management system, should preferably not be collected multiple times.

Core process, primary process	The processes for services that are related to a healthcare organisation's primary business purpose and contribute directly to the creation of added value. In the healthcare supply chain, these are processes for the provision of case-related services (see also: Management and support process) (Wirnitzer, 2009).
Classification	A structured organisation of compatible and mutually exclusive technical terms for services at different levels of detail vs. aggregation (groups, subgroups, individual services), used to analyse services for particular objectives (see also: Aggregation and service statistics) (cf. ISO, 2007).
Classification, secondary	A classification that can be used in parallel to the LEP classification of services. Each LEP secondary classification has an internal structure that is compatible with that of the LEP classification of services. If the information is already present in other systems within the organisation, e.g. in the personnel management, administration or finance and billing system, the relevant units in the LEP secondary classification should be replaced by equivalent elements in their application environment. The LEP secondary classifications include: (1) Organisation-specific addenda, (2) Case data, (3) Classification of occupations and (4) Personnel work time and absences.

Classification structure	The LEP classification of services is structured according to hierarchical criteria based on levels in a monohierarchical structure. Moving upward through the hierarchy, the four hierarchical levels are referred to as increasing levels of aggregation. Each level serves as an aggregation of the level below it, e.g. multiple interventions are merged into a single service subgroup, or multiple service subgroups are merged into a single service group. Moving downward through the hierarchy, the four levels are referred to as increasing levels of detail. Level 1 represents the highest level of aggregation, while level 4 represents the highest level of detail. Moving downward, levels 1 through 4 are categories defined as follows: • Main service group (one-place codes: 1), • Service group (two-place codes: 1.1), • Service subgroup (three-place codes: 1.1.1) and • Healthcare intervention or individual service (four-place codes: 1.1.1.1).
Compatible	Able to combine, fit together, or combine into a system. For example, LEP is compatible with international standards like ISO-18104 and ICNP that ensure a uniform data structure and a uniform semantics (terminology) so that relevant healthcare data can be shared in a consistent way between organisations and across international borders.
Context, contextualisation	The logical and conceptual setting in which a service is provided, or the factual and situational background against which a given service can be understood. Contextualisation makes it possible to carry over terms, situations and concepts from the original context to a different one, e.g. from LEP into a specific organisational setting. When reusing terms and concepts in this way, cultural, sociological, historical or semantic differences (among others) may play an important role.

Service	Both an action (process) and a result (outcome). From a behaviour-oriented perspective, a service is an action that is carried out in a certain way with a certain result in mind (cf. Healthcare intervention). From a results-oriented perspective, it is the result of those actions, and is evaluated e.g. with reference to the maintenance or improvement of a state of health, or the relief of suffering. The LEP classification of services provided by healthcare professionals describes these actions in a systematic way (cf. Classification). The result of the actions is evaluated with other classification systems and instruments, e.g. with quality indicators or scale-based assessments and diagnoses. A service which does not take quality into account is of little interest, due to the risk of undesirable effects (cf. e.g. Krempkow, 2005, pp. 17–18; Schedler, 2005, p. 11).
Service, (with and without) case assignment	Service types are divided into services with case assignment and services without case assignment.
Service, otherwise specified	Each service group in the LEP classification of services includes a "leftover class" for otherwise specified services. "Otherwise specified" services, e.g. "Otherwise specified movement" or "Otherwise specified training", are used to record services that are missing from or not contained in the LEP classification at the time of recording. What is unique about these services is the purposes for which they are used. They serve to (1) identify and temporarily bridge gaps in the content of the classification, i.e. to improve the validity of its content, and (2) identify and eliminate problems with understanding and applying the classification. Caution: Otherwise specified services must not be confused with "organisation-specific addenda" (see also: Organisation-specific addenda).

Service – task and person commissioning the task	A specific type of service recipient. The name and identification number for a task, e.g. for a project, an audit or a study on cardiac medication, and that of the party commissioning the task, e.g. for a university, person, company, institution or pharmaceutical company, can be freely defined by the organisation using LEP. The task can serve as the cost unit together with the party commissioning the task.
Service, effectiveness of	Selecting, planning and performing the right services in relation to health statuses, in an appropriate and evidence-based way (Gray et al., 2009).
Service, efficiency of	Performing the selected and planned service promptly, correctly and with an appropriate use of resources (personnel, materials) (Gray et al., 2009).
Service, provided	The action that was performed (see also: Service provider).
Service, required	Action that is necessary based on patient needs or based on guidelines and quality standards.
Service, received	The action that was received (see also: Service recipient).
Service, planned	Action entered in patient documentation in the treatment plan.
Service, coupled	Training, research and/or treatment process services that are carried out simultaneously. Example: One service is recorded as a service with case assignment ("Subcutaneously administering an injection"), the other as a service without case assignment ("Conducting a learning situation").
Service with case assignment	Actions with case assignment are performed "with", "on" or "for" a person. These services are performed according to various therapeutic approaches (concepts, methods, standards, guidelines). They are carried out in relation to states of health (assessments, diagnoses, objectives, outcomes) (see also: Healthcare intervention).
Service without case assignment	Actions without case assignment are performed to support, ensure and develop treatment and operational processes.
Service, safety of	Prevention of injury, undesired side effects, errors or complications in the performance of services.
Service, time spent on; service workload	The amount of time, e.g. in hours or minutes, spent on performing services with and/or without case assignment.

Service recipient	The person who is the target of actions. In the core processes of healthcare organisations, traditionally a patient, e.g. for “Supine positioning”. Depending on the type of service activity, service recipients can also be family members and other affected individuals, healthcare professionals, students, parties commissioning a task or cost centres and healthcare organisations.
Service provider	The person who carries out actions. In the core processes of healthcare organisations, traditionally a healthcare professional, e.g. for “Supine positioning”. Depending on the type of service activity, may include various healthcare professionals such as occupational therapists, midwives or registered nurses, but also cost centres or healthcare organisations.
Service statistics, analytics	The documentation, recording, analysis and preparation of data, e.g. about how services are delivered, the type of services and the time spent on them, the effectiveness of services or their benefit to patients, or about efficiency and the revenues or costs associated with the services provided in healthcare organisations. Three LEP analytics modules are available for service statistics: (1) LEP Standard Assessments, (2) LEP Data Comparison and (3) PCAP Suisse Data Comparison. They are described in detail in a separate document.
Management and support processes	Processes for services that support the core processes. These processes do not directly create added value, but they are necessary in order to carry out the core processes (see also: Core process) (Wirnitzer, 2009).
Mapping	The projection of a technical concept in one classification to the closest concept in another classification system. These classification systems are based on the same theoretical constructs, e.g. terms for healthcare interventions or for states of health are placed together in a single semantic context. LEP mappings are used to regulate the transformation of LEP terms into and out of other classification systems. For example, there is a mapping between LEP interventions (e.g. “Provide orientation training”) and ICNP interventions (“Perform reality orientation training”) (see also: Link) (cf. Aronson, 2006; IHE, 2015; ISO, 2013, p. 7; Mayr & Petras, 2008).

Module	A component that represents a clearly-defined part of a larger system, e.g. the LEP analytics module “PCAP Suisse” or the LEP classification of services.
Partitioning	Division or separation into distinct parts, e.g. LEP data are partitioned into distinct service domains, e.g. services with case assignment or allowance time, in order to avoid recording redundant data or for service statistics relating to personnel time.
Patient documentation, electronic	Local, organisation-specific and case-oriented documentation of treatment-related healthcare data that can be processed by a computer. An electronic patient documentation system may cover components of an electronic medical record (EMR), an electronic patient record (EPR), an electronic case file or an electronic health record (EHR) (cf. ISO, 2005, p. 2; NLM, 2016a; Semler, 2007, p. 3).
Medical record, electronic	A virtual record through which treatment-related data about a patient recorded in a decentralised way, or information recorded by the patient themselves, is available for access in a specific treatment situation (cf. FOPH, 2015, p. 4865).
Reference terminology	A terminology that is used to establish a relation between different classification systems. For example, SNOMED CT or ICNP can be used as a reference terminology to compare different classification systems in patient documentation (eHealth Suisse, 2016).
Standard productivity, case-oriented	The ratio of the time spent on services with case assignment to the resources used for each unit of time. Example: If the time spent on services with case assignment is 6 hours and the net work hours (“base productivity”) equals 8 hours, the standard productivity value is 75% (Fitterer et al., 2009).

Link	The connection between a technical term in one classification system and a technical term in another classification system, with a focus on the logic of clinical practice. These classification systems are based on different theoretical constructs, e.g. terms for healthcare interventions are placed together in a single semantic context with terms for states of health. In the LEP treatment process, for example, nursing diagnoses (e.g. "Orientation disorder") are linked with healthcare interventions ("Provide orientation training") (see also: Mapping).
Allowance time	Portions of work time that are required to cover organisational imperfections or to handle personal needs, e.g. relaxing, eating, drinking, or personal tasks. Allowance time is included in net work hours. If net work hours are compared to service times in analyses, it must be clarified how allowance times are to be taken into account at the recording, analysis and interpretation stages. If needed, allowance times can be recorded as "special service types" without case assignment, under the service subgroup "Waiting time" or "Work interruption" (see also: Work hours, net and Standard productivity, case-oriented).

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