

---

# Transferring Industry Approaches to Resource Management for FM in Hospitals - A Theoretical Reflection

Nicole Gerber<sup>1</sup>

<sup>1</sup> MSc in Business Administration, Institute of Facility Management, Zurich University of Applied Sciences, Campus Grueental, P.O. Box, 8820 Waedenswil, Switzerland PH (41) 58 934 53 91; email: nicole.gerber@zhaw.ch

## Abstract

Since the revision of the health insurance act and the introduction of the flat rate case system (SwissDRG), Swiss hospitals have been facing various challenges. One of these is to reduce costs in order to enhance competitiveness. As non-medical support services amount to 30 - 40% of the total costs in a hospital, they are of great importance in meeting this challenge. The introduction of the service allocation model for non-medical support services in hospitals as well as various research findings have revealed that resource management in hospitals is one area where improvement is needed in order to reach the cost reduction target. As industry had to overcome the same issue some time ago, the goal was to find if there are resource management industry methods and approaches used in industry that can be transferred to the hospital context. The insights presented here are based on a comparative literature review and subsequently the evaluation of different approaches to resource management. In conclusion it will be stressed that several approaches are worthwhile to be taken into consideration for further in-depth analysis. As a basis for further development and research projects, the Computer Integrated Manufacturing method (Y-CIM) together with the concept of the Point of Care (PoC), the extension of the algorithmic approach of the Clinical Pathways and the layout of the Supply Chain Operations Reference Model (SCOR) are introduced.

**Keywords:** hospitals, industry approaches, non-medical resource management

## Current Situation Of The Swiss Healthcare System

In Switzerland, a highly interlinked healthcare system has been developing within the past years. At least since the revision of the health insurance act and the introduction of the flat rate case system (SwissDRG) as of 1/1/2012, Swiss hospitals have been confronted with multifaceted challenges. First of all, the financing streams were modified, creating cost pressure on healthcare institutions and thus the need for all types of hospitals to be more competitive. Secondly, the high expectations which the general public as well as patients have of hospital service quality in the German speaking regions of Europe has to be taken into consideration in the analysis of this development (Klaus, 2012; Classen, 2012; Marsolek & Friesdorf, 2009). Thirdly, Swiss companies in general, but the healthcare sector in particular, face a shortage of qualified staff - this problem will be aggravated by the trend towards an aging population (Classen, 2009; Busse et al., 2009; Knoth et al., 2009). Finally, medical technology has been evolving very rapidly (Classen, 2009, Busse et al., 2009), increasing the already high complexity of healthcare and leading to an increased need for the managing of large amounts of information (Haux et al., 2010).

This is a significant challenge: managing this information is particularly difficult in hospitals, where to date there has been a very distinct labor division with a high level of specialization in different disciplines and a tendency of minimal structuring as well as a high human factor

---

---

effect (Kriegel, 2012; Schult, not dated). According to Kriegel (2012, p. 24) the partition of supply, demand, performance, consumption and financing of the different partial services as well as the separated market control of different stakeholders such as patients, health professionals and funding bodies have resulted in inefficiencies, lack of transparency and misallocations within the healthcare system and have led to a lack of information and information asymmetries between the market operators, as well as insufficient allocations of costs and benefits.

Dealing with these challenges, hospital managements have started to realize what Klaus (2012) outlines: that support processes in hospitals will be important in the realization of potential savings and that the impact of the non-medical services (infrastructure / facility management), whose costs amount to 30 - 40% of total costs (Abel, 2009; Abel & Lennerts, 2006), is very high in terms of helping to solve the current problems. As a first step toward becoming ready to systematically empower Swiss hospitals with the help of an effective and patient-oriented non-medical service package, a service allocation model for non-medical support services in hospitals was set up (Gerber et al., 2014). During the development of the model, it became clear, that resource management plays a major part in increasing effectiveness and efficiency. But unlike other facility management (FM) areas, there seemed to be very few methods and concepts of how to systematically handle the issues of resource management. This paper therefore shows different potential approaches to developing possible resource management approaches for non-medical resource management in hospitals.

#### **Service Allocation Model For Non-Medical Support Services In Hospitals (LemoS)**

According to the service allocation model for non-medical support services in hospitals based on SN EN 15221-4 (Gerber et al., 2014), the services can be differentiated between strategic management services, management support services, non-medical support services, medical support services and medical core services (see Figure 1). In the model, the facility/infrastructure management services in hospitals are comprised of all non-medical support services, excluding management support and patient management (see Figure 2). Due to the lack of other suitable models in other countries or other industries, LemoS was set up from scratch, taking the well accepted norm SN EN 15221-4 as a reference. The goal was to have a systematical basis in order to have both, a clear understanding and transparency of the services offered in the non-medical area as well as having the possibility to establish financial transparency and systematical solution alternatives. The model is currently being circulated for consultation among relevant and interested parties in FM and healthcare. The final version is expected to be published in the beginning of 2015 - first in German and then translated into English and French.

While having been able to delineate most of the sub-services by the means of iterative expert meetings and guided interviews with both norm and hospital FM experts, the service “resource management” was mentioned as an important non-medical support service but has not yet been clearly defined on a broadly accepted basis. It therefore became apparent that this topic has to be separately researched in-depth to find a clear definition of the service as well as methods to handle it systematically.

---

<p><b>Strategic Management Services</b></p> <ul style="list-style-type: none"> <li>Sustainability</li> <li>Quality Management</li> <li>Risk Management</li> </ul>	<p>Identity Strategic Process Management Resources &amp; Sourcing Strategy</p>	<p>Provision for Special Incidents Asset &amp; Portfolio Management</p>
<p><b>Management Support Services</b></p> <ul style="list-style-type: none"> <li>Finance &amp; Accounting</li> <li>HRM</li> </ul>	<p>Legal Services</p>	<p>Marketing &amp; Communication</p>
<p><b>Non-medical Support Services</b></p> <p><b>Space &amp; Infrastructure</b></p> <ul style="list-style-type: none"> <li>Space/Accommodation</li> <li>Outdoors</li> <li>Cleaning, Reprocessing of</li> <li>Medical Devices, Disposal &amp; Recycling</li> <li>Security</li> <li>Medical Movables &amp; Immovables</li> <li>Non-medical Movables &amp; Immovables</li> </ul>	<p>Connecting Space &amp; Infrastructure and People &amp; Organization</p>	<p>People &amp; Organization</p> <ul style="list-style-type: none"> <li>Health &amp; Safety</li> <li>Hospitality</li> <li>Logistics</li> </ul>
<p><b>Medical Support Services</b></p>	<p>pharmacy, laboratory, social services/pastoring, research &amp; science, patient disposition services (incl. patient administration, disposition of beds and patients)</p>	
<p><b>Medical Core Services</b> (according to DIN 13080:2003-07)</p> <p><b>Examination and Treatment:</b> reception and emergency care, medical services, functional diagnostics, endoscopy, clinical pathology, morgue/pathology, radiological diagnosis, operation, childbirth, radiology, nuclear medical therapy, physical therapy, ergotherapy, on-call duty</p> <p><b>Care:</b> general care, care of women in childbirth and newborns, intensive-care medicine, dialysis, baby and pediatric nursing care, infectious diseases care, care of mentally ill, nuclear medicine, care on admission, gartiatrics, day clinic</p>		<p><b>Project Management</b></p>

© 2009 PM, Author: Mecke Garber

Figure 1. Service levels in hospitals

Source: Gerber et al. (2014)

<b>90 Strategic Management Services</b> 91 Sustainability .10 Life Cycle Planning/Engineering .20 Environmental Protection .30 Energy Management  92 Quality Management .10 Standards & Guidelines Definition  93 Risk Management .10 Risk Policy Definition  94 Identity .10 Innovation Facilitation  95 Strategic Process Management  96 Resources & Sourcing Strategy  97 Provisions for Special Incidents  98 Asset & Portfolio Management .10 Management of Investments, Portfolio & Multiprojects .20 Financing Management	53 Legal Services 54 Marketing & Communication 55 Administration
<b>50 Business/Management Support</b> 51 Finance & Accounting 52 HRM	
<b>10/20/30 Non-medical Support Services</b> <b>10 Space &amp; Infrastructure</b> 11 Space/Accommodation .10 Property Administration .20 Minor Maintenance, Operation & Minor Tenant Fitout of Buildings & Installations .30 Supply & Disposal of Utilities  12 Outdoors .10 Administration & Beautification of Properties, Sites & Lots .20 Maintenance & Operation of additional Areas on Site .30 Parking Lot Operation & Maintenance	13 Cleaning, Reprocessing of Medical Devices, Disposal & Recycling .10 Cleaning .30 Reprocessing of Medical Devices .40 Disposal and Recycling  14 Security .10 Fire Protection .20 Property Protection .30 Asset Protection .40 Personal Protection .50 Information Protection
<b>30 Connecting Space &amp; Infrastructure and People &amp; Organization</b> 31 Operational Resource Management  <b>20 People &amp; Organization</b> 21 Health & Safety .10 Health & Safety In/on Buildings .20 Health & Safety at Work Stations & Facilities .30 Health & Safety through Humans, Practices & Exposure .40 Health & Safety through Work Organization & Special Protection  22 Hospitality .10 Reception & Contact Center .20 Catering & Vending Services .30 Owner-operated Kiosks and Shops .40 Event Management .50 Supply of Workwear & Textiles .60 Childcare .70 Library .80 Non-medical Patient Care .90 Management of Accommodations	15 Medical Movables & Immovables (acc. to Ordinance of Medical Products i.e. patient beds) .10 Operation & Maintenance of medical Movables & Immovables  16 Non-medical Movables & Immovables (i.e. movables, planting & room decoration, artworks, transport fleet) .10 Operation & Maintenance of non-medical Movables & Immovables
	32 Information & Communication Technology ICT  23 Logistics .10 Relocation .20 People Transport .30 Goods Transport & Distribution .40 Warehousing .50 Mall/Courier Services .60 Documents Management .70 Signage Services
	33 Procurement .10 Tactical Procurement .20 Operational Procurement

© Z-HW/PM, Author: Nicole Gerber

**Figure 2. Allocation model for non-medical support services in hospitals based on the SN EN 15221-4 norm (LemoS)**  
 Source: Gerber et al. (2014)

---

### **Importance Of Resource Management In Hospitals**

The importance of resource management in hospitals can be derived from the results of many studies. Kriegel (2012, p.4) emphasizes the fact that the effective provision of resources in the wards and for the staff is one of the major value factors in hospitals. Fischlein & Pfänder (2008) add that only those hospitals that provide at least the same service as their competitors but with less resource usage will survive while Busse et al. (2009, p. 17) point out that the financial surplus needed for future investments can only be generated by an effective application of resources and Kriegel (2012) and Marsolek & Friesdorf (2009) specify that in order to improve the performance spectrum, the focus has to be laid on the adept combination of resources. In terms of modern healthcare controlling, ZfCM (2008, p. 217) clearly states that resource management is an absolute must, especially taking into consideration the increasing scarcity of resources in the future which makes demand-actuated supply of resources particularly important in order to avoid materials and personnel shortages (Klaus 2012). Another aspect is brought up by Pocsay & Distler (2009) who state that patient care has so far worked due to good education and motivation of the staff, but that the service and resource allocation have often been inefficient. Finally, Oberender (2005, p. 56) emphasizes that the efficient application of resources in hospitals do not contradict the provision of high quality.

In addition, Dannemeier et al. (2009, p. 281) predict that in the future, the only way of improving healthcare organizations in general will be by implementing more IT systems. Schult (not dated) says the same thing about IT-supported hospital resource management in particular, and Haux et al. (2010) mention that professional IT-supported information management is the source of higher productivity, quality improvement and cost cutting. Many companies and hospitals already have Enterprise Resource Planning (ERP) software implemented and in use. Nevertheless, unfortunately it seems that real resource planning is not being adequately undertaken. Mertens (2001, p. 183) explains this situation by the fact that ERP is a very inadequate term due to the fact that the software applications mainly deal with business processes and not the resources themselves or their planning. Especially in hospitals, there seems no adequate, integrated and holistic tool for IT-supported resource planning at the moment. Therefore, a parallel empirical study is currently being conducted by the author with the aim of investigating the requirements of IT-supported non-medical resource management in order to set a starting point for further developments in collaboration with software providers. The results of this study will be published separately.

### **Attempt to Define Non-Medical Resources in Hospitals**

As mentioned above, the exact resources which have to be included in the future definition of resource management in hospitals, have not yet been empirically researched. According to Businessdirectory (not dated), the definition of resource management reads as follows:

“The process of using a company's resources in the most efficient way possible. These resources can include tangible resources such as goods and equipment, financial resources, and labor resources such as employees. Resource management can include ideas such as making sure one has enough physical resources for one's business, but not an overabundance so that products won't get used, or making sure that people are assigned to tasks that will keep them busy and not have too much downtime.”

When searching for different forms of manageable non-medical resources according to LemoS (Gerber et al., 2014), the following characteristics were found in the literature:

- beds
  - devices
  - rooms
  - infrastructure
-

- 
- portfolio
  - area
  - energy sources
  - nourishment
  - linen/clothes
  - non-medical consumer goods
  - investment and assets
  - communication
  - non-medical staff

(Blöchle & Lennerts, not dated; Gansert, 2009; Haux et al., 2010; Hizgilov & Redlein, 2011; Kriegel, 2012; Mauro, 2012; Möhl & Klöcker, 2004/2005; Schult, not dated; von Trotha, 1995)

### **Trends And Problems In Healthcare Institutions**

When trying to find workable solutions for effective resource management in hospitals in the future, it is important to look at general trends in the sector in order to align the suggestions with other affected areas. Kriegel (2012) was found to offer the most holistic view. Generally speaking, he mentions the trend of business professionalization in the whole healthcare sector combined with an increasing deregulation and privatization of formerly public health services. Deriving from that, he predicts the development of an increased customer and stakeholder focused relationship stance and the realization of profit by optimized structures and process organizations. Furthermore, he forecasts more standardizations and modularizations in all hospital areas, more interdisciplinary interconnections, more globalization in the supply of healthcare resources and services and a continual development of pharmacological and pharmaceutical products, as well as medical-technological improvements.

In coping with those future trends, the hospitals seem to struggle with several challenges. Raab (2001) mentions the fact that structures and organization forms are the way they are for historical reasons and that they do not match the current requirements. Johner & Haas (2009) refer to the different thinking and linguistic worlds of doctors, technical staff and economists. Kriegel (2012) explains that in the past there was a lack of transparency and measurement of performance and processes, leading to the fact that interconnections are unclear and therefore controlling towards more productivity and service orientation is lacking. In terms of healthcare IT, conhIT (2013) emphasizes the fact that the currently available IT systems are not able to handle the full complexity of hospitals. It becomes clear that there is a great need for solutions approaches for (Swiss) hospitals.

### **Study Purpose and Approach**

Bearing the above mentioned circumstances and challenges in mind, the high-level objectives of more effective resource management is to create a basis for effective and efficient (IT-supported) resource management in hospitals in order to render assistance in overcoming the great challenges that Swiss hospitals currently face, mainly to have

- better cost transparency
- better resource usage and thus higher sustainability
- rational cost cutting steps
- systematical investment decisions
- the possibility of “balanced rationalization instead of mundane rationalization” (Marsolek & Friesdorf, 2009, p. 326-327; translated by the author).

The focus of this paper, however, is to present and discuss concepts as well as theories applied in resource management in various industries. This is done for the purpose to learn

---

---

about their potentials of being successfully applied in the hospital context; thereby not ignoring the interdependencies of the current challenges.

To best learn about the different concepts and theories a systematic literature review was carried out in German and English resources. The focus was first of all on the geographical peculiarities due to the political setup of the healthcare system and secondly on the disciplinary interdependencies. The review was conducted on the topics of resource management in general and on the healthcare sector and industry in particular, as well as IT-supported resource management in industry and the healthcare sector. In order to ensure the quality of the literature, only current and/or very specific primary sources by authors with a proven track-record in scientific publications was taken into consideration.

### **Comparison Between Industry And The Hospital Sector**

Doctors usually oppose the comparison between hospitals and industry and conhIT (2013) admits that a hospital is not a car plant, but that with IT support, it has to be possible to plan the unpredictable to a certain extent, just as is done in industry. Busse et al. (2009, p. 16) specify that the doctor-patient relationship is just as well suited to the implementation of modern IT-supported standard processes with a customer orientation and with flexible structures as customer relationships in banks or insurance companies. And Oberender (2005, p. 53) compares companies in industry with hospitals by describing the same conflict of goals between the company/hospital internal resource based view opposed to the market-oriented process and patient/customer view. As Fischlein and Pfänder (2008, p. 31-32) depict in Table 1, several obvious parallels cannot be denied.

**Table 1. Similar Success Factors for Industry and Hospitals**

<b>Industry</b>	<b>Hospital</b>
Fast production	Short dwelling time in the hospital
Little idle time	Little idle time
Low error and repair quota	Minimal re-operation and infection rate
No unnecessary transits at the conveyer belt	No un-indexed double examinations
Optimized stock	Optimized capital utilization
Few transports	Few relocations
Efficient production planning	Efficient treatment planning
Reduced space required	Reduced space required

Source: Fischlein and Pfänder, 2008, p. 31-32; translated by the author

This comparison together with the trends and problems described above strongly indicate that the healthcare sector is now at the stage that the production industry was about 30 years ago. In the 1980s and 90s, there was a great increase in IT investments in almost all branches, and IT has been intensively integrated into the business processes over the last 20 years, thus changing the businesses immensely (Behrendt, 2009). In the healthcare sector, even though experts talked about IT implementation even at the early stages, the execution was conducted much slower than in other sectors (Behrendt, 2009). Walther & Becker (2009, p. 375-377) add another fact that differentiates industry and hospitals: even though both areas have the same high expectations towards secure and highly available IT services and software, the IT budgets in the healthcare sector are much lower, compared to other industries. According to the authors, the same basic technology is usually implemented in industry and hospitals, thus as less finances are available for IT in hospitals, it logically follows that IT staff in hospitals must be currently getting paid much less than their counterpart in industry.

Looking at the trends, the current challenges and the particular situation of healthcare organizations, the assumption has to be made that just as companies in industry went through a change in terms of IT-integration in managing their resources, the healthcare sector will

---

have to follow suit. Due to the apparent parallel, approaches of IT supported resource management in industry should be transferrable to the healthcare environment.

### Possible Problem-Solving Approaches

In order to industrialize a hospital, Kriegel (2012) suggests several approaches, which have been implemented in the industry:

- standardizing and modularizing every department
  - setting up a flexible system of service, support and infrastructure network
  - extending the target system from the purely specialized areas to a holistic view
  - introducing an overall service oriented view
  - completing a 90 degree shift from an organizational structure to an operational structure.
- Salfeld et al. (2009) suggest the switch from cost to profit centers while Hizgilov and Redlein (2011) recommend the more systematic spotting and deployment of synergies. Haux et al. (2010) propose a more holistic cooperation in the hospital as an entity. Nevertheless, in terms of resource management, those approaches seem to influence the implementation but do not offer a specific basis for combining approaches.

One of the concrete models possibly suitable for resource management seems to be the Y-CIM-model of Scheer (1994). The model combines the business oriented production planning on the left side of the Y shape with the technical oriented production on the right side of the Y shape (see Figure 3).

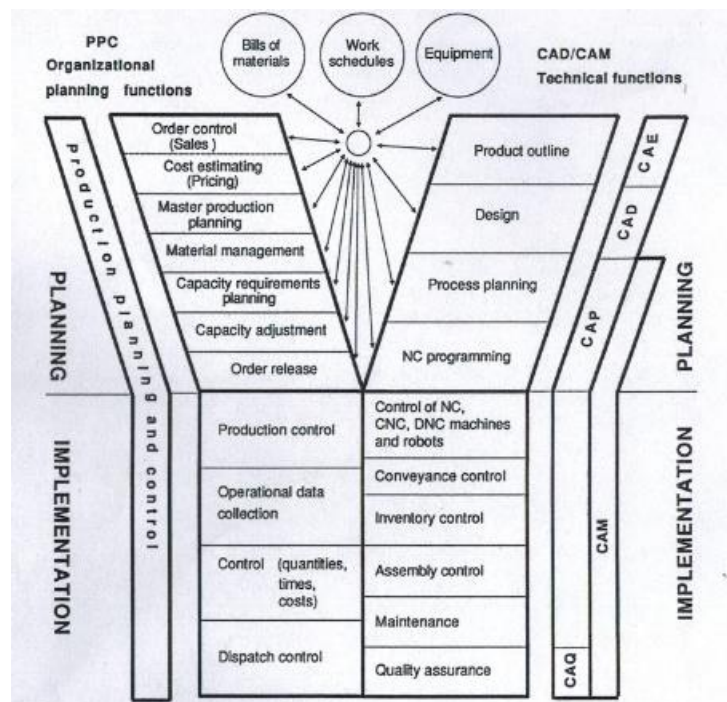


Figure 3. Y-CIM-model Information Systems in Production

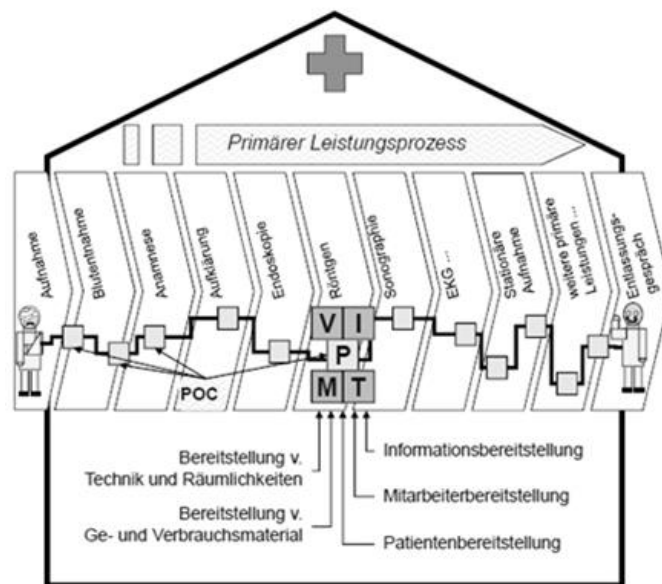
Source: Scheer (1994, p. 2)

Transferring this idea of combining a technical and a production stream to the hospital resources context, it is conceivable that two streams could here also be looked at in parallel with the non-medical service provision on one side and the collaterally necessary resources on the other. However, this idea would not include the corresponding medical services.

With a similar idea, Kriegel (2012) describes the provision of factors of production at the Point of Care (PoC). In Figure 4, he combines the medical core processes (illustrated with the

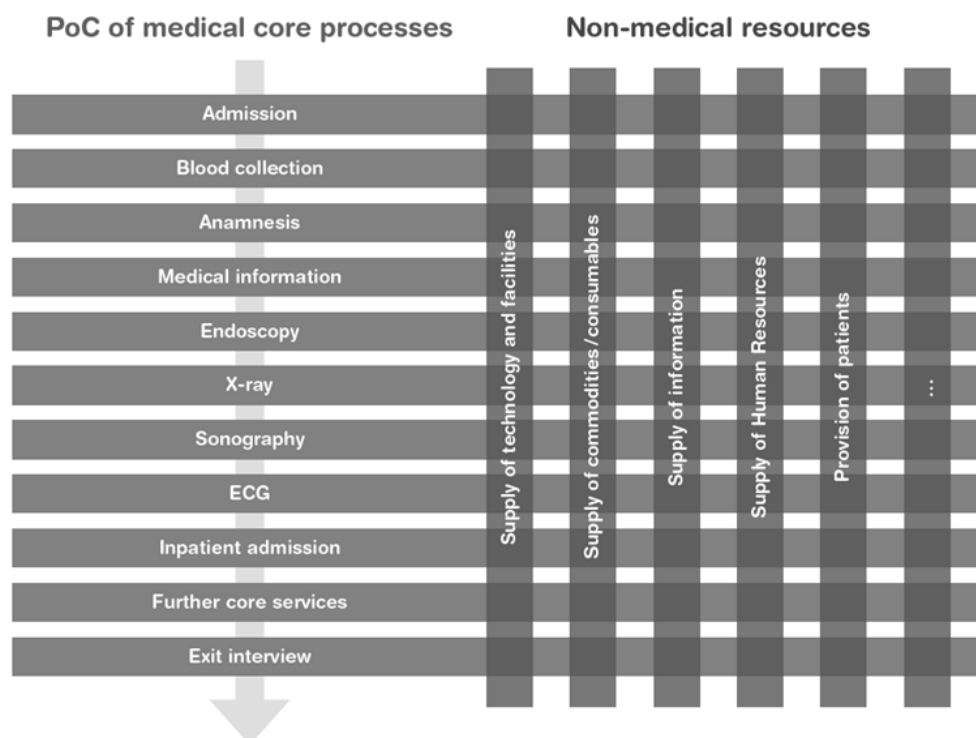


arrow shapes) with the resources provided during the process steps (depicted in the cubes labeled with V, I, P, M and T, representing “Provision of durables and non-durables”, “Provision of technology and space”, “Provision of information”, “Provision of staff” and “Provision of patients”.



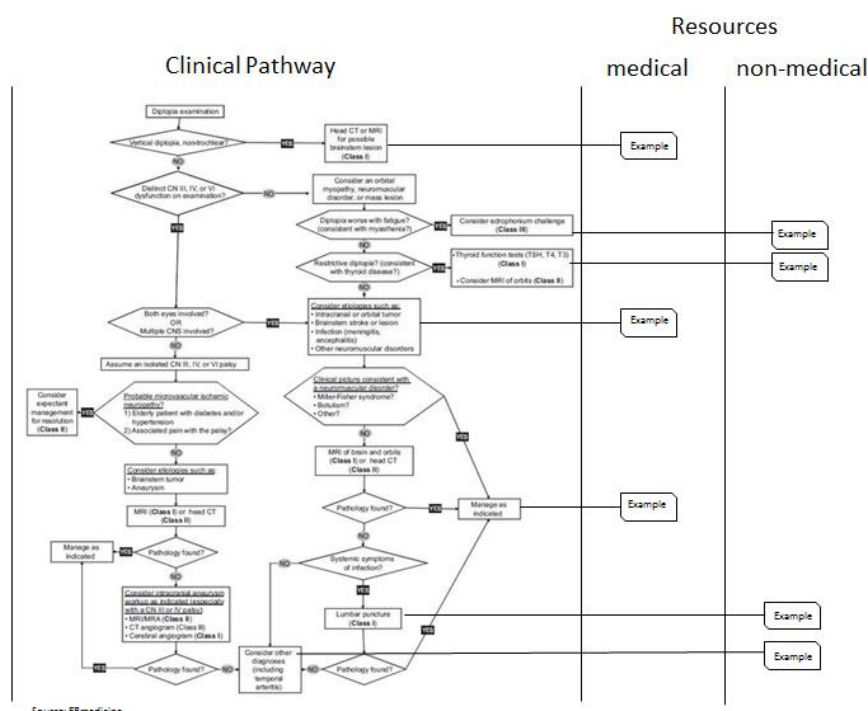
**Figure 4. Provision of factors of production at the Point of Care**  
Source: Kriegel (2012, p. 118)

Taking this idea and marrying it with the Y-CIM-model described above, there could be another systematical way of illustrating the medical process on the left and the collateral non-medical necessary resources on the right side. As depicted in Figure 5, this shows clearly the complexity of the interfaces between the processes and the resources.



**Figure 5. Resource management at the point of care**

Event Driven Process Chains (EPC) have been implemented in industry for quite a while. A specific form of EPC are the Clinical Pathways described by Rieben & Müller (2005) and Ollenschläger et al. (2005) as algorithms depicted as constructed paths. Oberender (2005, p. 21) explicitly declares Clinical Pathways as a means of better allocating scarce resources. However, so far, only medical paths were drawn, neglecting the corresponding non-medical services and/or the resource accompanying the provision of medical services. Taking the suggestion of Drawert (2005) and Kriegel (2012) of integrating all categories of services into the value chain into consideration, this leads to the idea of integrating non-medical services and/or resources into the existing concept of the (medical) clinical pathways. One notion on how this approach could look like is illustrated in Figure 6. Instead of the simple process steps on the left side in Figure 5, the notation of EPC allows a much more detailed visualization.



**Figure 6. From the critical pathway to the holistic pathway including the resources view**  
Source: adapted from EBmedicine (n.d)

Another approach that could be further investigated is the Supply Chain Operations Reference (SCOR) Model (Supply Chain Council, 2012). This reference model’s goal is “to describe the business activities associated with all phases of satisfying a customer's demand.” (Supply Chain Council, 2012, p. i.2). The SCOR-Model consists of three defined levels:

Level 1: Process Types (Scope)

Level 2: Process Categories (Configuration)

Level 3: Process Elements (Steps)

all of which cover best practices in the categories of Performance, Processes, Practices and People in a systematic way, including questions of an effective and efficient management of resources on many different sub-levels. This model which is aimed at Supply Chain Operations could serve as a guide for developing non-medical best practice processes in hospitals including the corresponding management of resources.

### Conclusion

As the above presented shows, industrial approaches of handling resources in a systematical way can indeed be transferred to the hospital context. However, this has so far only been done

---

occasionally and not in a holistic way. It goes without saying that the existing industry models and approaches cannot be applied one-to-one in a hospital environment but have to be adapted which will most likely take some time and undergo several iterations taking the complexity of the hospital context in consideration. In addition, IT will have to provide supporting systems and applications - cooperation between the IT and the FM experts will therefore be necessary. In general, the presented approaches can help with the communication between medical and non-medical service providers as well as for a more holistic understanding of the very complex hospital system and thus contribute to improvement of service quality and efficiency. Looking at the fact that industry went through a very similar development as hospitals are now, and facing the fact that industry has been developing different successful approaches and experiences, hospital managers and facility management researchers should consider different existing approaches and taking lessons learnt into consideration. It seems that the idea of looking at the resources at the Point of Care, the extension of the clinical pathway idea to a holistic view as well as parts of the SCOR-Model are suitable bases for further research and developments.

### **Critical appraisal**

So far only cases and debates in the German and English speaking contexts were reflected on and compared. Own empirical engagements are there to be planned and carried out within short.

### **Outlook**

Several research teams are currently investigating the specific possibilities of the ideas outlined above. One of the specific research questions is the systematic integration of medical and non-medical processes combined with the resource allocation. Another topic to be investigated more in detail is the specific measurement of resources within the processes. For this purpose, an FM KPI model in hospitals is currently being set up. Once the mentioned ideas are all empirically researched and visualized accordingly, the different approaches can be compared and tested for their suitability for practical implementation through which they can then be validated. In parallel, empirical research on the technical possibilities of IT supported resource management in hospitals is being conducted by the author. The results of these studies will be published separately.

### **Acknowledgements**

Morgan Kavanagh for proofreading, Viola Läubli and Susanne Hofer as co-authors of LemoS and all the members of the Think Tank FM in Healthcare (Swiss Association for Facility Management and Maintenance fmpro, the partner hospitals, the business partners and all the involved colleagues in the Institute of Facility Management of the Zurich University of Applied Sciences) for their collaboration

### **References**

- Abel, J. (2009). *Ein produkteorientiertes Verrechnungssystem für Leistungen des Facility Management im Krankenhaus*. Doctoral dissertation. Karlsruhe: Universitätsverlag.
- Abel, J., and Lennerts, K. (2006). Cost allocation for FM services in hospitals. *The Australian Hospital Engineer*, 29(3), 41-47.
- Behrendt, I. (2009). Klinische Informationssysteme im Krankenhausmanagement: Eine neue Sicht auf die Entwicklung und die Einführung innovativer KIS. I. Behrendt, H.-J. König and U. Krystek, eds.. *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
-

- 
- Blöchle, D., and Lennerts, K. (not dated) *Introduction of a space management in a hospital*. <[http://www.tmb.kit.edu/download/Space\\_Management\\_in\\_Hospitals\\_2011\\_12\\_05\\_Daniel\\_Bloechle.pdf](http://www.tmb.kit.edu/download/Space_Management_in_Hospitals_2011_12_05_Daniel_Bloechle.pdf)> (Feb. 24, 2014).
- Businessdirectory (not dated). Resource management. <<http://www.businessdictionary.com/definition/resource-management.html>> (May 14, 2014).
- Busse, R., Tiemann, O., and Wörz, M. (2009). Veränderungen des Krankenhausmanagements im Kontext des Wandels internationaler Gesundheitssysteme. I. Behrendt, H.-J. König and U. Krystek, eds.. (2009). *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
- Classen, R. (2009). Basisinformationen zum Gesundheitswesen Ch. Johner and P. Haas, eds.. *Praxishandbuch IT im Gesundheitswesen. Erfolgreich einführen, entwickeln, anwenden und betreiben*. München: Hanser.
- conhIT. (2013). *Ressourcenmanagement im Krankenhaus: Potenziale längst noch nicht ausgeschöpft*. <<http://www.conhit.de/Presse-Service/Pressemitteilungen/index.jsp?lang=de&id=286272>> (Feb. 20, 2014).
- Dannemaier, G., Clasen, C., and Burkart, St. (2009). IT und KTQ® zur Unterstützung des Qualitätsmanagements und der Managementbewertung. I. Behrendt, H.-J. König and U. Krystek, eds.. *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
- Drawert, S. (2005). Corporate Performance Management in Logistik und Beschaffung - Mit Supply Chain Controlling gezielt Schwachstellen aufdecken. A.-W. Scheer, W. Jost, H. Hess and A. Kronz, eds.. *Corporate Performance Management - ARIS in der Praxis*. Berlin et al.: Springer.
- EB Medicine. (not dated). *Clinical Pathway Diplopia*. <[http://www.ebmedicine.net/topics.php?paction=showTopicSeg&topic\\_id=23&seg\\_id=3734](http://www.ebmedicine.net/topics.php?paction=showTopicSeg&topic_id=23&seg_id=3734)> (May 21, 2014).
- Fischlein, J., and Pfänder, T. (2008). *Industrielles Klinikmanagement*. München: FinanzBuch Verlag.
- Gansert, U. A. (2009). IT als Unterstützungsinstrument des Prozessmanagements in Krankenhäusern. I. Behrendt, H.-J. König and U. Krystek, eds.. *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
- Gerber, N., Läubli, V., and Hofer, S. (2014). *Leistungszuordnungsmodell für nicht-medizinische Supportleistungen in Spitälern (LemoS) in Anlehnung an SN-EN 15221-4 - Vernehmlassungsversion 1.1*. Think Tank FM in Healthcare ed..
- Haux, R., Winter, A., Ammenwirth, E., and Brigl, B. (2010). *Strategic Information Management in Hospitals. An Introduction to Hospital Information Systems*. New York et al.: Springer.
- Hizgilov T., and Redlein, A. (2011). Einsparungspotenziale, Produktivitätssteigerungen und Kostentreiber im Facility Management. *Journal für Facility Management - Wissenschaft trifft Praxis*. Wien: TU, IFM. 3/2011 p. 18-25.
- Johner Ch., and Haas, P. (2009). Vorwort in Johner, Ch.; Haas, P. eds.. *Praxishandbuch IT im Gesundheitswesen. Erfolgreich einführen, entwickeln, anwenden und betreiben*. München: Hanser.
- Klaus, P. (2012). Geleitwort in J. Kriegel. *Krankenhauslogistik - Innovative Strategien für die Ressourcenbereitstellung und Prozessoptimierung im Krankenhauswesen*. Wiesbaden: Springer Gabler.
- Knoth, St., von Allmen, U., Radnic, S., and Riggerbach, U. (2012). *Exzellenzmanagement - Bausteine eines strategischen und operativen Managements im Krankenhaus*. Bern: Hans Huber.
-

- 
- Kriegel, J. (2012). *Krankenhauslogistik - Innovative Strategien für die Ressourcenbereitstellung und Prozessoptimierung im Krankenhauswesen*. Wiesbaden: Springer Gabler.
- Marsolek, I., and Friesdorf, W. (2009). Changemanagement im Krankenhaus - im Mittelpunkt der Mensch. I. Behrendt, H.-J. König and U. Krystek, eds.. *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
- Mauro, Ch. (2012). *Serviceorientierte Integration medizinischer Geräte. Informationsmanagement und Computer Aided Team*. H. Krömer, ed.. Wiesbaden: Springer Gabler.
- Mertens, P. (2001). Enterprise Resource Planning (ERP). P. Mertens, ed.. *Lexikon der Wirtschaftsinformatik*. Vierte, vollständig neu bearbeitete und erweiterte Auflage. Berlin et al.: Springer.
- Möhl, U., and Klöcker, K. (2004/2005). IT-gestütztes Daten- und Prozessmanagement - Anforderungen, Realisierung und Nutzen im technischen Gebäudebetrieb. *Fach.Journal* 2004/2005, p. 99-103.
- Oberender, P., and Zerth, J. (2005). Clinical Pathways als eine Zukunftsstrategie des Krankenhauses: eine gesundheitsökonomische Einführung. P. O. Oberender, ed.. *Clinical Pathways - Facetten eines neuen Versorgungsmodells*. Stuttgart: Kohlhammer.
- Ollenschläger, G., Kirchner, H., and Kirchner, A. (2005). Standards und Richtlinien in Behandlungspfaden: Standardisierbarkeit ärztlicher Leistung. P. O. Oberender ed.. *Clinical Pathways - Facetten eines neuen Versorgungsmodells*. Stuttgart: Kohlhammer.
- Pocsay, A., and Distler, O. (2009). Geschäftsprozessmanagement im Gesundheitswesen - Organisation und IT wachsen zusammen. I. Behrendt, H.-J. König and U. Krystek, eds.. *Zukunftsorientierter Wandel im Krankenhausmanagement. Outsourcing, IT-Nutzenpotenziale, Kooperationsformen, Changemanagement*. Berlin, Heidelberg: Springer.
- Raab, M. (2001). Plädoyer für ein verbessertes Ressourcenmanagement. *Bulletin von Medicus Mundi Schweiz* Nr. 82, Oktober 2001. <<http://www.medicusmundi.ch/mms/services/bulletin/bulletin200103/kap01/06raab.html>> (Feb. 20, 2014).
- Rieben, E., and Müller H.-P. (2005). Clinical Pathways als Grundlage einer effizienten Kostenrechnung. Das Modell integrierter Patientenpfade „mipp“. P. O. Oberender ed.. *Clinical Pathways - Facetten eines neuen Versorgungsmodells*. Stuttgart: Kohlhammer.
- Salfeld, R., Hehner, S., and Wichels, R. (2009). *Modernes Krankenhausmanagement - Konzepte und Lösungen*. Zweite, aktualisierte und erweiterte Auflage. Berlin, Heidelberg: Springer.
- Scheer, A.-W. (1994). *CIM Computer Integrated Manufacturing - Towards the Factory of the Future*. Third, Revised and Enlarged Edition. Berlin et al.: Springer.
- Schult, R. (not dated). *Data Mining für das Ressourcenmanagement im Krankenhaus*. Magdeburg: Arbeitsgruppe KMD, Fakultät für Informatik, Otto-von-Guericke-Universität.
- Supply Chain Council. (2012). *SCOR Supply Chain Operations Reference Model - Revision 11.0*.
- von Trotha, K. (1995). Informationsverarbeitung bei den Universitätsklinika Baden-Württembergs. W. Buchholz and R. Haux, eds.. *Informationsverarbeitung in den Universitätsklinika Baden-Württembergs*. Heidelberg: Symposium September 1995.
- Walther, St., and Becker, K. (2009). Betrieb von IT-Systemen im Gesundheitswesen. Ch. Johner and P. Haas, eds.. *Praxishandbuch IT im Gesundheitswesen. Erfolgreich einführen, entwickeln, anwenden und betreiben*. München: Hanser.
-

---

ZfCM - Zeitschrift für Controlling und Management. (2008). Krankenhauscontrolling:  
Effektives Kosten- und Ressourcenmanagement. *Controlling & Management PRAXIS  
Magazin*. 52. Jg. 2008, H4, p. 217.

---