

# **Experiences from Healthcare Logistician Education**

Ulla Kotonen<sup>1</sup>, Ullamari Tuominen<sup>1</sup>, Ann-Nina Maksimainen<sup>2</sup>, Miika Kuusisto<sup>2</sup>
(1. Faculty of Business Studies, Lahti University of Applied Sciences, Finland;
2. Faculty of Social and Health Care, Lahti University of Applied Sciences, Finland)

**Abstract:** The need for healthcare services is increasing due to ageing population in most countries. At the same time, financial resources are decreasing. This means that healthcare services need to be developed and healthcare organisations have to find new and more efficient operating models. Healthcare logistics would aid that process by strengthening logistical operations and allowing nurses to concentrate on nursing.

A healthcare logistician (HL) service concept and a healthcare logistician education (HLE) are examples of the latest innovations of the Finnish healthcare logistics. The essential idea behind the concept of healthcare logistician is to free traditional healthcare personnel of the need to conduct logistics operations, enabling them to have more time for patients. Working in the demanding healthcare environment and supporting healthcare professionals in their work requires a new type of combination of logistics and healthcare competences, which can be acquired through a new healthcare logistician education.

The aim of this study is to describe and analyse the first experiences of HLE, a new type of demand-driven and outcome-oriented further education for logistics positions in healthcare organisations (HOs), which aims to meet the expectations of HOs which have implemented or are planning to implement HL service concept and those of individuals' working in healthcare logistics.

Key words: healthcare, logistics, healthcare logistician, education innovation, competence assessment

## 1. Introduction

This paper is a description of the first experiences of healthcare logistician education (HLE). HLE is a new type of demand-driven and outcome-oriented education in logistics for healthcare organisations (HOs). A healthcare logistician is a logistics professional who also understands the everyday life of nursing and speaks the same professional language as the nursing staff. The education aims to meet the expectations of HOs that have implemented or plan to implement a healthcare logistician service concept and/or recruit individuals to work in healthcare logistics.

Ulla Kotonen, Dsc (Econ. & Bus. Adm.), RDI Director, Faculty of Business, Lahti University of Applied Sciences; research areas/interests: competence management, corporate social responsibility (CSR) reporting, regional development. E-mail: ulla.kotonen@lamk.fi.

Ullamari Tuominen, MSc (Econ), Senior Lecturer, Logistics, Faculty of Business, Lahti University of Applied Sciences; research areas/interests: healthcare logistics, competence management and well-being in logistics centers.

Miika Kuusisto, MBA, Senior Lecturer, Logistics, Faculty of Social and Healthcare, Lahti University of Applied Sciences; research areas/interests: logistics & supply chain management, healthcare & hospital logistics.

Ann-Nina Maksimainen, MNSc, Faculty of Social and Healthcare, Lahti University of Applied Sciences; research areas/interests: healthcare management.

The education is based on the results of the Healthcare Logistician Project (2012–2013), funded by TEKES (the Finnish Funding Agency for Technology and Innovation) as part of their Innovations in Social and Healthcare Services programme, which aims to renew health and social services and increase business opportunities. The project was implemented in cooperation with a private supplier of transport and logistics services, Uudenmaan Pikakuljetus Oy — part of the global DSV group, two regional hospital districts and Lahti University of Applied Sciences (Lahti UAS). The aim of the project was to create a new service concept, a new profession, define a job description and set competence requirements for it as well as develop education for healthcare logisticians.

Currently HLE is s developed and implemented by Lahti University of Applied Sciences in cooperation with public sector organisations. The HLE is bachelor's degree level further education — European Qualifications Framework (EQF) and National Qualifications Framework (NQF) level 6. The study programme consists of six modules including social and healthcare issues, logistics, team and interpersonal skills development, project work and practical training. The pilot HLE programme, a group of 14 students, began at the end of 2013 and finished in November 2014. The education was evaluated based on data collected from the students and their workplaces, the healthcare organisations and observations made by teachers during the teaching. One of the most important evaluation materials consists of the competence assessment surveys completed at the beginning and at the end of the education. In addition, a feedback survey was completed at the end of the programme.

This paper starts with short descriptions of the special characteristics of healthcare logistics, the new service concept and the profession of healthcare logistician, the job-based competences of the profession, and the healthcare logistician education. Next, the results from the competence assessment and feedback surveys completed by the pilot study group are presented. After that, the experiences of the students, their workplaces and teachers are analysed. Lastly, the future development needs for HLE are discussed.

## 2. Characteristics of Healthcare Logistics

Healthcare organisations are complex and challenging process organisations containing actions, structures that have demanding material and personnel flows in which logistics contribute greatly to the quality of the operations (Fraunhofer, 2013; Vos et al., 2011; Beaulieu et al., 2012). Logistics plays an increasingly important role in healthcare, and it has become one of the largest cost factors for hospitals and other healthcare organisations (Lillrank & Haukkapää-Haara, 2006; Pohjosenperä, 2012). Simultaneously, financial and human resources have decreased in the healthcare sector. This has meant an increasing demand for more efficient productivity and material flows, the reallocation of existing human resources, changes to former working methods and the development of innovative working practices.

According to Keskiväli's (2007) empirical study, one of the greatest challenges of internal, in-house and department logistics of healthcare organisations is related to the efficient use of human resources. Too many persons (nurses, practical nurses, instrument technicians, etc.) are involved in logistics tasks and distribution of work is often unclear, instructions are insufficient and systems too complicated. Also, orientation and training for inventory and materials management is often inadequate. Eskelinen (2006) has estimated that approximately 25% of the nurses' tasks are purely support-service based tasks including a lot of logistics tasks. Also Graban (2008) has pointed out that nurses' time cannot be wasted by having them do logistics tasks. Thus, there is a need to reconsider what tasks are done by which employees, especially nurses' tasks need re-definition.

The second challenge is related to the department, situational and availability logistics, especially to the

inventories and availability frequency. Patient procedures are the defining factors in healthcare, and inventory placement is defined by how quickly supplies and equipment need to be available. Some supplies need to be readily available within hours and some within minutes or immediately. Due to different availability demands there are too many, too small and badly located stores, the shelf system and the use of space are impractical (Keskiväli, 2007).

## 3. Healthcare Logistician Service Concept and Profession

The key idea of the healthcare logistician service concept is based on Keskiväli's (2007) findings that the organisation of logistics functions and the descriptions of those functions are insufficient for the specialised, modern healthcare industry. In essence, the education of personnel conducting healthcare logistics is inadequate, and full-time employees who are educated in logistics are sorely lacking in knowledge about healthcare. The essential idea behind the concept of healthcare logistician and HLE is to free traditional healthcare personnel of the need to conduct logistics operations, enabling them to have more time for patients. The aim is that the tasks of department logistics will be given over to HLs who are educated for the purpose, but who also understand the special characteristics of the demanding healthcare environment (Figure 1).



Figure 1 Healthcare Logistician As A Part of Logistics of Healthcare Organizations (Niiranen, 2015)

Healthcare logisticians work in a variety of healthcare organisations. Despite the differences in their working environments, healthcare logisticians support the work of healthcare professionals; they understand the requirements of nursing and also speak the same professional languages as nursing staff and logisticians. Furthermore, they take care of all variety of goods needed in healthcare operations, so that all the goods are in the right place at the right time, although they do not participate in nursing or the handling of medicines. In-house logistics cover tasks of the handling of supplies from the point of receiving all the way to the maintaining departments' buffer stocks and furthermore maintaining positive supply levels at regional care centres of the healthcare district. Department logistics is divided into availability and situational logistics where the first concentrates on maintaining the basic department operations, the second enables the operations based on the care

situation. In addition to availability and situational logistics tasks, HLs also closely cooperate with the in-house and external logistics operations of other healthcare organisations when planning order-delivery processes and creating the preparedness of components and stock buffering, etc. A HL is also a developer, a person who critically analyses logistics processes and functions and develops them.



Figure 2 Cost Savings in Healthcare Logistician Service Concepts (Niiranen, 2015)

As indirect effects, cost savings (Figure 2) arise in two ways: first they move logistics activities away from expensive treatment rooms, thereby freeing room capacity for more productive use. Second, the supplies used become standardised. The expected benefits of the HL concept include reduced travel and search times, improved supply flows, efficient team working, clearly defined process ownerships, balanced workloads, and better spatial use solutions, thereby improving quality and patient safety.

## 4. Healthcare Logistician's Professional Competencies

The new profession also has new requirements for its required competences, skills and knowledge. The competence identification of an HL completed as a part of the Healthcare Logistician Project was based on the concept of professional competence (e.g., Torr, 2008) which Epstein and Hundert (2002) have defined from the healthcare sector point of view as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served". The competence identification process was realised through workshops with professionals from regional hospital districts. Thus, the competence areas of HLs described in this paper are based on empirical data collected in the HL and ESLogC projects in 2009-2013 and completed with the existing competence-based qualifications of warehouse maintenance and instrument technicians. Also, ELA Standards of Competence on the Supervisory/Operational Management Level (European Logistics Association, 2011) were utilised.

The competence requirements of a HL are a combination of logistics and healthcare skills, which are based

on the concepts of job-related (e.g., Guthrie, 2009; Eraut, 1994; Epstein & Hundert, 2002; Le Diest & Winterton, 2005; Mulder et al., 2007) and professional competence (e.g., Calhoun et al., 2002). The competence description of a HL is not a set of minimum competency requirements for all HLs in all healthcare organisations but is more a collection of abilities to perform tasks and duties. Due to professional competences being context-dependent (e.g., Cheetman & Chivers, 1996, 1998; Boyatzis, 2008; Winter & Achtenhagen, 2009; Bartlett et al., 2000), they differ not only between individuals but also between organisations, thus they should be considered based on the needs of the respective organisation. Despite contextual differences, the definition of competence requirements creates a collective understanding and agreement on the professional requirements for the profession of healthcare logistician.

A competent HL professional masters his/her work processes by means of the methods, tools and materials available and while observing occupational safety. In addition to occupational skills, he/she also has interpersonal and personal skills; the competence map of a HL highlights functional competences (tasks that HLs should be able to do), but strongly recognises both cognitive (what and why) and behavioural competences (how to behave).

The competence map of an HL (Appendix 1) contains 11 task-related competence areas:

(1) Can plan and manage warehouse operations,

(2) Can carry out orders,

(3) Is familiar with duties connected to receiving the goods and shelving services,

(4) Is familiar with duties connected to the collection of goods as well as shipment processes,

(5) Can establish a shelving service,

(6) Is able to carry out stock management tasks,

(7) Can store and handle hazardous materials and chemicals,

(8) Is able to carry out infection prevention measures in accordance with best practices, the organisation's quality system, instructions and legislation,

(9) Is able to plan and develop healthcare logistics and understands the role of healthcare logistics as part of the overall healthcare process,

(10) Has knowledge of acts, decrees, regulations and guidelines governing his/her work practices, and

(11) Can maintain and enhance customer and stakeholder relations.

In addition to task-related competence areas, the competence map contains four interpersonal and personal skill areas: general working life skills, personal skills, language skills, and technology and information technology skills.

The competence map highlights functional competences, tasks that HLs should be able to do as defined by Cheetham and Chivers (1996 and 1998) but also strongly recognises both cognitive (what and why) and behavioural competences (how to behave). This supports the idea that, a competent HL professional should master the work processes for which he/she is paid, by using the methods, tools and materials available, whilst observing not just occupational safety but also ensuring patient safety.

## 5. Education for a Healthcare Logistician

Due to the particularly demanding work environments and the requirement to continuously renew multi-disciplinary practical knowledge, existing logistics or healthcare education do not meet the high standards and requirements of healthcare logistics. Consequently, a special competency based healthcare logistician education programme (HLE) that combines logistics and healthcare education is required.

The HLE is bachelor's degree level further education (European Qualifications Framework and National Qualifications Framework level 6) that can offer new bachelor level studies at both universities and universities of applied sciences. It is also possible to integrate and/or credit HL studies (30 ECTs) into part of a bachelor's degree. As it is further education, the curriculum is based on the student's experience (or likely personal experience) of practical working life and personal commitment to the development of professional expertise. HLE is based on the idea that competence is developmental and the development of competence serves not only students' personal goals, but also the needs of HOs. Thus the HLE aims to increase the expertise of students and provide HOs with new perspectives on the development of their work, their work and workplaces, while supporting the implementation and development of the healthcare logistician concept in HOs. In this context, knowledge based learning and practical training are implemented in parallel with and overlap with a HOs' development projects.

The curriculum of a HLE consists of six modules including orientation to the healthcare logistician concept, healthcare and logistics studies, team and interpersonal skills development, project work and practical training. The first module focuses on the healthcare logistician concept, the healthcare logistician profession and competence identification. The second module analyses the role of a HL from the healthcare perspective. The third module examines the logistics opportunities that can improve an organisation's profitability and presents a variety of methods to achieve the objectives. The fourth module deepens team and networking skills. The last two modules focus on workplace development in practice. From the healthcare point of view, students should, for example, be familiar with healthcare legislation and able to work in the arena of laws, regulations, guidelines and contracts, be able to design and implement a risk management of logistics activities related to patient safety, be familiar with the principles of aseptic infection control and also know and identify their organisation's major products and categories.

From a logistics point of view, students should understand logistics supply chain management and their opportunities to influence the profitability of their organisation through logistics; be able to plan and control warehouse operations; be able to monitor the consumption of products and take economic efficiency into account; understand public procurement regulatory objectives, guiding principles and their practical significance; understand LEAN thinking; be able to analyse logistics functions from the process point of view; and be able to identify the development areas. After the programme, the students should also understand their role within a logistics' service chain; be able to design, develop and evaluate healthcare logistics services; and apply their expertise in practical projects.

Competence assessment surveys play an important role in HLE. Surveys serve students' personal goals but also the needs of HOs and educational organisations. At the beginning of the programme, the competence assessment provides useful information about the individual strengths and weaknesses of the students, and guides the learning process by showing the gaps between an individual's competences and the needs of HL occupation. For HOs, it guides a process of institutional self-reflection and provides data for the future development of an HL's tasks in the organisation as well as a communication vehicle. It also helps to define targets for the students' development projects. For the education institutions, it provides information about curriculum development, the planning of the content of individual courses and the use of learning methods.

The competence assessment survey is repeated at the end of the programme. Here the idea is to analyse the students' competence development and provide a detailed picture of their study results. For the education organisation, the second competence assessment survey, together with other gathered feedback information,

provides evidence of the achievement of a student's objectives and the effectiveness of the education.

#### 6. Results of the Pilot Healthcare Logistician Programme

The first study group started in November 2013 with 14 students representing regional healthcare districts and municipal HOs. The represented HOs have very different experiences of healthcare logistics because the level of healthcare logistics processes varies between organisations as well as the implementation stage of the healthcare logistician profession. In the most progressive organisation, there are already 4 healthcare logisticians working, whereas some of the organisations are only considering the implementation of the HL model. Most of the students had a vocational degree in business, logistics (warehouse operative, instrument technician) or healthcare (practical nurse), but there were students from other study fields too (e.g., a chef). Only one of the students had a degree in logistics (Bachelor of Business Administration, BBA) from a university of applied sciences. The other students had a vocational qualification. The students' average age was 39; their ages ranged between 21 and 53 years. This, naturally, meant that there were huge differences in work experience and learning skills. At the beginning of the HLE, all of the students worked in different logistics tasks in HOs. All of the students, except one, completed their education and graduated in November 2014. The students' project work concerned the development of shelving services; quality manuals; customer satisfaction surveys regarding shelving services; a job description of HL; and the development of logistics in an operating unit.

At the beginning of the programme, students completed a competence assessment survey based on the competence map of HE. The personal competence assessment form consisted of 14 competence areas and work task columns (a total of 110 items). At the end of the programme, the competence assessment survey was completed with one new competence area with 6 new tasks added to the form. This competence area was absent from the first survey due to a technical error. The occupational skill levels were used as assessment criteria to assess how the students mastered their job duties as related to the work processes as well as their personal skills. Each competency was evaluated subjectively on a 1 (novice) to 5 (expert) scale [16] or with a comment of "no experience". The evaluation scale was defined as follows:

- (1) Can operate with guidance and use the knowledge and skills learned during the programme;
- (2) Can apply their knowledge and skills but requires occasional support and guidance;
- (3) Can work independently, draft plans and evaluate what is important;
- (4) Can use knowledge and skills in new situations and is able to develop operations; and
- (5) Can utilise objective information in order to develop their own skills and can teach/guide others.

There was a separate set of criteria for interpersonal and personal skills that established a shared understanding of what was being assessed. In addition, background information about the students' workplace, occupation, work experience and educational background were asked. The competence assessment surveys were supported by tutor led workshops with students and feedback from representatives of the HO institutions. The feedback was used for a deeper understanding of the contextual issues but also for minimising unintentional discrepancies between the real and reported values.

Based on the first competence assessment, students defined their own competence development needs. Most of the important development matters named by students were the same as those they listed as their weakest competence items, however, some of the strongest items were mentioned, too. This indicates that the students wish to develop not only their weakest but also their strong competences, which must be taken into account when

defining the training focus.

According to the competence assessment surveys, the competence levels of the students increased in all the analysed competence areas on the group level. The average mean value of all the competence areas increased from 2.3 to 2.8. The average mean value of the occupational task-based competences increased from 2.1 to 2.8. Their interpersonal and personal competences also increased but much less than most of the task-based competence areas (mean value increased from 2.8 to 2.9). At the group level, the average competence increase in task-based competences was 0.7 and 0.4 for interpersonal and personal skills, respectively. The development of the occupational task-based competence areas are presented in Figure 3 and the development of interpersonal and personal skills in Figure 4.



Figure 3 The Mean Values of the Occupational Task-Based Competences for Each Competence Area at the Beginning and at the End of the HLE Programme

The best and the weakest task-based competence areas were the same at the beginning and at the end of their education. The strongest three competence areas were related to ordering, goods delivery and customer and stakeholder relations. The weakest competence areas were related to the establishing of a shelving service, the planning and development of a healthcare logistician's work and the planning and managing of warehouse operations.



Figure 4 The Mean Values for Interpersonal and Personal Skills Regarding the Competence Areas at the Beginning and at the End of the HLE Programme

On the individual student level, there were huge differences in the competence levels at the beginning and at the end of the programme but also in the development of competence areas. At the end of their training, the student-based means varied between 0.0 and 5.0 for occupational, task-based competences (for each competence area) and between 1.0 and 4.5 for interpersonal and personal skills. For the individual competence items, the answers differed from no experience (0) to expert (5). The differences between the students are explained by the heterogeneous backgrounds of the students. In addition, HL is a new profession and its tasks and responsibilities are on different levels in the students' home organisations. In the most cases the competence levels were higher at the end of training but there were also some cases where the level of single competence area was decreased during the education. The differences between the students' competence development can be explained by differences in their competence levels at the beginning of the course. The decreased competence levels are also explained, at least partly, by a growing understanding of the competence areas due to their improved measurement during the course. The differences were also further evaluated by comparing the two largest student groups: practical nurses and warehouse operatives/instrument technicians. The warehouse operatives/instrument technicians' average mean value in all competence areas was higher than the practical nurses both at the beginning and at the end of education. The practical nurses mean values were also lower than the average mean values of the whole pilot study group. The better results of the warehouse operatives/instrument technicians are explicable with regard to their occupation, task-based competence areas (most of the competence areas were related to logistics), but not explicable with regard to interpersonal and personal skills. During their education, the competence gap between the warehouse operatives/instrument technicians narrowed in all competence areas except the handling of hazardous materials and chemicals, knowledge of acts, decrees, regulations and guidelines, and language skills. At the end of the course, the smallest competence gap between these two groups was in the storing and handling of hazardous materials and chemicals and the largest in ordering.

The results from the first competence assessment clearly show the need for HLE. The second competence assessment survey reported the students' increased competences, and showed in which competence areas the programme had best succeeded in raising the students' competence levels. Despite the increased competence levels, the mean value was lower than 3 in five of the ten task-related competence areas and in two of the four interpersonal and personal skill areas at the end of training. This means that there are still students who are not able to work independently, draft plans and evaluate what is important; and even less able to use knowledge and skills in new situations and to develop operations or teach/guide others. This, and other issues, will have to be improved before the next study programme begins.

## 7. Feedback and the Future Development of Healthcare Logistician Education

At the end of the training, the students filled in a feedback form. The feedback form consisted of 11 statements about their training. The statements concerned the students' expectations, the usefulness of the training, the content of the training, pre-information, the expertise of the teachers, the teaching methods, support from the group, the study environment and other practical arrangements. The students answered each statement subjectively by using the Likert scale: 1 = "totally disagree", 2 = "partly disagree", 3 = "neither agree nor disagree", 4 = "partly agree", 5 = "totally disagree". The overall mean value of all the statements was 3.8 which is good for this type of further education. For all the statements, except the amount of pre-information, the mean value was over 3.0. In particular, teachers and the study environment received excellent feedback (mean values were over 4). In addition to these statements, there was an open question for which feedback was given verbally. In this feedback section, the students hoped to have more contact days and more visits to healthcare organisations. Networking, benchmarking, sharing best practises and peer learning were shown to be important for students and, for this reason, it would appear important to leave enough time for discussions during the ten contact days. One of the 13 students wrote that he/she would participate again.

With regard to designing the next HLE there are several issues to be considered. First of all there is a need for more multi-professional (logistics and healthcare) course planning to better unify these two essential areas of HL. At the beginning of the next programme, more pre-information must be added to, for example, course content and schedules. As trainers, we understand the students' need for more contact days, but from the HOs' point of view it is difficult and expensive to organise more leave of absence days. This means that we have to utilise interactive e-learning possibilities even more than we have done. In particular, the level of e-learning orientation must be deeper at the beginning of the studies. Furthermore, differences in individual learning skills should be taken into consideration more than they were. Finally, because project work for project planning and the writing of final reports has an important role in HE and we discovered that the students do not have enough skills and experience in writing scientific text, alternative implementation methods for learning project work skills need to be developed.

The informal feedback from the students' work places and HOs, indicated satisfaction with the programme. It seems that the HOs especially appreciate project work which develops different logistics issues and defines areas

for future development. To better communicate with and inform the HOs we will publish an e-letter "Greetings from the HE". In the future we shall increase the number of e-letters, so as to guarantee better understanding from and cooperation with HOs. The other issues valued by the HOs were the students' increased ability to take on more responsibility in their own work and their improved understanding of the HL processes. The education also enhanced positive flow in the development of the healthcare organisations.

### 8. Discussion

Based on our experiences from the pilot programme, a combination of the profession-based competence map and personal competence assessment seems to be a very good and useful tool for developing the curriculum for the new HLE as well as for planning the content of the individual courses. The pilot education showed that a variety of different learning methods are needed due to differences in the students' backgrounds and their workplaces. Even if the HLE is further education, most of the students had a vocational education background. Before the pilot education, we surmised that the most appropriate background for HL studies would be a vocational degree in business or logistics, e.g., warehouse operative, instrument technician; or people working in healthcare, such as a practical nurse. In reality, the students came from a variety of different backgrounds, which created extra challenges for their training, the teaching methods used and the learning assignments. The students also came from very different organisations. In the most progressive organisation, there were already four healthcare logisticians working, whereas some of the organisations were only considering the implementation of a HL model. The pilot course also indicated how challenging it is to educate people to be multi-skilled. It was found to be fundamentally important that HLE is carried out in cooperation with trainers from healthcare and logistics, but also in deep cooperation with healthcare organisations. In the future, this cooperation should be developed even further.

Despite all the information gathered and the experiences gained, the healthcare logistician concept remains very new. In the most progressive organisations, several HLs are already working, whereas others are only considering the implementation of a healthcare logistician model. Defined competence requirements and healthcare logistician education decrease uncertainty, reduce resistance and increase confidence in the profession. In addition to the HLE, benchmarking and sharing best practices will also be important competence development methods. Based on the experiences of the pilot HLE programme, there is a clear and growing need for this new profession and the education provided by this programme, however, much work has still to be done to market it and its benefits to healthcare organizations. Even though the education provides new skills for the HL s profession the main task is still to gain the trust and understanding of all the Healthcare organisations. This new way of holding down costs and improving quality of care needs to be recognized at the management level. That means understanding healthcare logistics as part of the strategic perspective of the organizational development.

#### References

Bartlett H. P., Simonite V., Westcott E. and Taylor H. R. (2000). "A comparison of the nursing competence of graduates and diplomates from UK nursing programmes", *Journal of Clinical Nursing*, Vol. 9, pp. 369–381.

Beaulieu M., Landry S. and Roy J. (2012). "The productivity of hospital logistics operations: Technical report", Centre sur la productivitéet laprospérité, HEC Montréal.

Boyatzis R. E. (2008). "Competencies in the 21st century", Journal of Management Development, Vol. 27, No. 1, pp. 5–12.

Calhoun J. G., Davidson P. L., Sinioris M. E., Vincent E. T. and Griffith J. R. (2002). "Towards an understanding of competency identification and assessment in health care management", *Quality Management in Health Care*, Vol. 11, No. 1, pp. 14–38.

- Cheetman G. and Chivers G. (1998). "The reflective (and competent) practitioner: A mode of professional competence which seeks to harmonise the reflective practitioner and competence-based approaches", *Journal of European Industrial Training*, Vol. 22, No. 7, pp. 267–276.
- Cheetman G. and Chivers G. (1996). "Towards a holistic model of professional competence", *Journal of European Industrial Training*, Vol. 20, No. 5, pp. 20–30.
- Epstein R. M. and Hundert E. M. (2002). "Defining and assessing professional competence", JAMA, Vol. 287, No. 2, pp. 226-235.
- Eraut M. (1994). "Learning professional processes: Public knowledge and personal experience", in: Eraut M. (Ed.), *Developing Professional Knowledge and Competence*, London, England: Felmer Press.
- European Logistics Association (2011). "ELA Standards of competence on the supervisory/operational management level", available online at: http://www.elalog.eu/sites/default/files/downloadables/110101ELAStandards.pdf.
- Fraunhofer IML (2013). "Hospital logistics", available online at: http://www.iml.fraunhofer.de/en/fields\_of\_activity/ health\_care\_logistics\_en/hospital\_logistics.html.
- Guthrie H. (2009). "Competence and competency-based training: What the literature says", available online at: http://www.ncver.edu.au/publications/2153.html.
- Keskiväli E. (2007). "The logistics of an operation unit: Case the central operation unit of Päijät-Hämeensosiaali- ja terveysyhtymä", Bachelor's Thesis in Financial Management and Healthcare, Lahti University of Applied Sciences.

Le Diest F. and Winterton J. (2005). "What is competence?", Human Resource Development International, Vol. 8, No. 1, pp. 27-46.

- Lillrank P. and Haukkapää-Haara P. (2006). "Terveydenhuollon tilaaja-tuottaja-malli", available online at: http://ktm.elinar.fi/ktm\_jur/ktmjur.nsf/all/F26FF8E12B71CEA9C2257100003540CA.
- Mulder M., Weigel T. and Collins K. (2007). "The concept of competence in the development of vocational education and training in selected EU member states: A critical analysis", *Journal of Vocational Education and Training*, Vol. 5, No. 1, pp. 67–88.
- Niiranen K. (2015). "The healthcare logistician concept", unpublished PowerPoint presentation.

Pohjosenperä T. (2012). "Terveydenhuollon logistiikan tutkimus", available online at: http://www.terveysjatalous.fi/docs.

- Torr A. (2008). "A complex view of professional competence", in: 17th National Vocational Education and Training Research Conference, NCVER, Adelaide.
- Vos L., Chalmers S. E., Dückers M. L., Groenewegen P. P., Wagner C. and Van Merode G. G. (2011). "Towards an organization-wide process-oriented organization of care: A literature review", *Implement Sci*, Vol. 6, No. 8, pp. 1–14.
- Winther E. and Achtenhagen F. (2009). "Measurement of vocational competencies: A contribution to an international large-scale assessment on vocational education and training", *Empirical Research in Vocational Education and Training*, Vol. 1, No. 1, pp. 85–102.

Competence	1	2	3	4	5	6	7	8
areas	-	-	5	-	5	Ŭ	,	Ū
Can plan and	Works with	Makes proposals	Determines the	Calculates inventory	Utilises inventory	Ensures adequate	Monitors inventory	
manage	healthcare	on unit storeroom	space requirements	value, inventory	management	safety stocks	levels	
warehouse	personnel to	location(s)	of stocked items	turnover and	indicators in the	-		
operations	determine standard	Designs layouts		determines the stock	planning and			
-	products/ sets/	and product		service level	management of			
	packs	locations			inventory operations			
Can carry out	Makes orders with a	Extracts data and	Creates barcodes for					
orders	handheld reader and	updates the	new, variable					
	"spike orders" in	handheld reader	products					
	the ward storeroom,	with new						
	wash rooms and	products on a						
	operating theatres	weekly basis						
Is familiar with	Receives, checks,	Signs	Unpacks deliveries	Delivers express	Places products in	Replenishes	Creates new shelf	Unloads and
duties connected	sorts and logs	consignment		orders immediately	appropriate shelf	supplies in the	locations	dispatches
to goods delivery	deliveries in the IT	notes and enters		to the ward	locations in wards,	operating theatre		automated
and shelving	system	reservations on		Transports products	the central			guided
service		the consignment		to the ward	storeroom and			vehicles
		note if necessary		storeroom	external units			
Is familiar with	Gathers customer	Delivers goods	Packs goods	Produces waybills	Sends ordered	Signs delivery		
duties connected	orders according	and signs	Wraps rollers and		goods to the	notes		
to the collection	to collection list	collection lists	labels them		destination			
of goods as well								
as shipment								
processes								

Appendix 1 A Competence Map of Healthcare Logistician

## Experiences from Healthcare Logistician Education

Can establish a shelving service Is able to carry out stock management tasks	Agrees on meetings with customers Presents the shelving service concept Draws up schedules Identifies and knows different products and product groups and their storage units	Produces and posts product consumption lists Designs and leads a product selection meeting Manages and maintains alert limits Monitors the consumption, adequate levels and expiry of products Can take care of obsolete products for re-sterilisation or removes them from the stock balance	Designs the storeroom layout Orders shelves Checks and maintains stock balances Carries out stock transfers and returns	Maintains product labels Creates a laminate list for products ordered on an <u>as-needed basis</u> Creates labels for new products in the central storeroom	Creates a product category list Produces consumption lists	Stocks shelves with the agreed products in the appropriate order Maintains order in the storeroom (e.g., empty boxes, broken products)	Arranges information events and provides guidance to customers Attends meetings Carries out stocktaking	Checks consumption (3-6 months), alert limits and delivery lot sizes Ensures that products and products and packaging are recycled according to instructions and regulations
Can store and handle hazardous materials and chemicals	Identifies and knows hazardous materials and their labels and ensures appropriate signage	Stores and handles hazardous materials and chemicals in accordance with regulations	Complies with the company's guidelines on health and safety	Ensures appropriate packing, package materials, labelling, transport, shelving and storage of hazardous materials	Is able to use extinguishers and first-aid equipment in emergencies and knows their locations in the ward	Identifies and assesses environmental risks and hazards		
Is able to carry out infection prevention measures in accordance with best practices, the organisation's quality system, instructions and legislation	Is able to plan and deliver patient safety with regard to risk management in healthcare logistics	Cooperates with the organisation responsible for infection prevention	Finds solutions to promote infection prevention in cooperation with healthcare logisticians, the hygiene unit or a team of specialists	Takes into account the health-economic effects of infections in personal decisions and practices	Recognises and follows the targets and requirements of the workplace quality system	Uses different types of cleaning, disinfection and sterilisation methods in daily healthcare logistics and in special situations	Assesses and develops personal practice and healthcare logistics with regard to infection prevention	
Is able to plan and develop healthcare logistics and understands the role of healthcare logistics as part of the overall healthcare	Monitors changes in laws and regulations governing healthcare from the point of view of logistics	Monitors new opportunities in healthcare logistics offered by technical and practical advances	Determines customers' needs and requirements related to products, services and organisations in the personal practice area	Designs and develops service products to respond to changes, customer needs and opportunities with a holistic and cost-conscious approach	Monitors, controls, assesses and develops the customer service process	Understands his or her personal role as part of the overall process and as one link in the patient's care		
Has knowledge of acts, decrees, regulations and guidelines governing his or her work practice	Is aware of the normative and informational governance of social and healthcare	Knows key areas of labour legislation	Knows the main points of legislation on public contracts and the main stages of the contract process	Knows regulations governing the storage and transportation of healthcare supplies	Knows the documents which govern the operations of the organisation	Is able to draw up instructions for different types of customer groups in different operational environments		
Can maintain and enhance customer and stakeholder relations	Serves customers with a friendly attitude Maintains customer relationships and contributes positively to the image of healthcare logistics	Advises, guides, informs and instructs internal and external customers Provides information about operative changes	Actively collaborates with colleagues, nurses, head nurses and collectors to deliver product, service and customer solutions	Takes into account the principles of internal customer accounts Recognises and has a good understanding of the interfaces of his or her work vs. patient care Knows the meaning of urgency by each location	Handles customer claims between stakeholder groups, taking into account the customer's point of view Determines the reasons for claims and ensures that remedial measures are implemented	Assesses and measures the quality, performance and productivity of healthcare logistics processes and operations	Gives and receives feedback and encourages colleagues	
Demonstrates interpersonal skills	Interaction skills	Communication skills	Cooperation skills	Problem-solving skills	Learning skills	Ethical skills	Aesthetic skills	
Demonstrates personal skills	Operates at a high standard with a customer-oriented approach	Works in accordance with legislation, regulations and guidelines	Maintains a tidy and orderly workplace	Takes care of worker welfare and health	Works in accordance with the principles of sustainable development	Possesses project-work and team-work skills	Possesses language skills	Utilises technologies and ICT