

WP1 Final project report

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Patient

Improving the continuity of patient care through teaching and researching novel patient handover processes in Europe

Final Project Report

[Public Part]

Improving the continuity of patient care through teaching and researching novel patient handover processes in Europe

Project information

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Executive summary

This report contains the complete project reporting of the PATIENT project from October 2012 until end of March 2015. It provides a summary of all project activities and achievements that are based on the previous WP deliverables such as the project progress reports from WP1 (D1.01) and the quality assurance reports from WP6 (D6.01). This report therefore presents an overview about empirical studies of the stakeholder needs analysis, as conducted in WP2 (D2.01), and the learning outcomes study for the handover study module of WP3 (D3.01).

It also shows an outline of the handover curriculum as produced in WP4 (D4.01) that got translated from English into German as well as Spanish with all three versions being available for public use on the project website. In addition to the handover curriculum from WP4, this report also describes the developed tools for handover training such as the award-winning CLAS and e-DL app, the SimHand app, the Handover toolbox 2.0, a handover e-Learning course, and the PATIENT pocket cards.

The handover curriculum and the training tools have been implemented and evaluated in WP5 in three University pilot studies in Spain, Germany, and Ireland. This final report also roughly summarises some high level outcomes of those studies from the WP5 deliverable D5.01.

The dissemination of the project (WP7) has been a key focus of the consortium since the project started. In the last years, the PATIENT project has developed a strong online presence, with the website being the central point for the distribution of contents and events as well as using various social media channels as reported in D7.01. Until March 2015, the PATIENT project has published 2 journal articles, 14 conference presentations, provided 7 stakeholder workshops, and made 92 blog posts about the latest developments on the handover topic attracting over 15850 visitors from all over the world. With the latest developments the project will publish at least four more journal articles, two of which have already been submitted and are now already under review.

Within the last four months the project has developed an exploitation strategy in WP8 to continue the fruitful cooperation among the consortium partners on the important handover topic. The consortium aims to establish a PATIENT foundation that will carry on to maintain and further develop the PATIENT training and tools (see D8.01).

The final contribution of the PATIENT project is a thoroughly validated handover study module with advanced teaching and learning methods and tools which can be tailored to the needs of participating partners and other stakeholders across the EU. Those outcomes are unique and in high demand by the medical field.

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1. Project Objectives

The World Health Organisation lists inaccurate handovers as one of its High 5 patient safety risks (WHO, 2011). A handover is the accurate, reliable communication of task-relevant information between doctors and patients and from one caregiver to another. This occurs in many situations in healthcare. Improperly conducted handovers lead to wrong treatment, delays in medical diagnosis, life threatening adverse events, increased healthcare expenditure, increased hospital length of stay and a range of other effects that impact on the health system (Kripalani et al., 2007).

The PATIENT project addressed this challenge by using innovative learning approaches with mobile devices in role-based learning scenarios in the medical field to enable authentic skill development for students and employees at the workplace. It built on previous work around the handover topic, i.e. the FP7 HANDOVER project (FP7-HEALTH-F2-2008-223409) (Groene, Orrego, Suñol, Barach, & Groene, 2012; Hesselink et al., 2013; Stoyanov et al., 2012). Previous experiences and outcomes like the Handover Toolbox (Drachsler et al., 2012) have been customised within the PATIENT project to provide an adaptable training module that can be integrated into existing patient safety courses.

In the PATIENT project the Handover Toolbox was further developed and combined with mobile apps to support good handover practice in training and real settings. One of these apps is the CLAS app, a mobile application to structure handover processes between different medical departments as well as hospitals and General Practitioners (GPs) (Maher et al., 2013; Maher, Drachsler, Kalz, & Specht, 2012). The PATIENT project sought to further enrich our knowledge on the merits of implementing highly innovative learning environments (e.g. Handover Toolbox) that offer sophisticated ICT tools (such as the CLAS app), to enhance interaction between students, teachers, researchers and patients, thereby encouraging the exchange of knowledge and ideas to increase awareness, understanding and pioneering solutions for the important global handover issue.

The primary objective of the PATIENT project was the implementation of a handover study module for undergraduate medical students in the participating partner sites in Ireland, Germany and Spain. The target study module took advantage of innovative teaching and learning methods to improve handover procedures. Therefore, the module combined formal, informal, problem- and role-based learning scenarios in simulation settings. It benefited from the Handover Toolbox, the CLAS mobile application, and additional tools (e-DL App, SimHand App, e-Learning course, Pocket Cards) that were developed within the PATIENT project to standardise handover procedures and their training in Europe.

The PATIENT study module with its tools is available for undergraduate medical students and transferable to higher education institutes and workplace learning opportunities EU-wide. As the handover topic is that urgent, the project reinforced the contribution of higher education to the process of education, research and innovation in undergraduate medical education.

The outcomes of the project are being disseminated to allied healthcare professions e.g. nursing, paramedics, and retirement homes that also demand accurate handover communication.

The developed module has a pedagogical focus, which incorporates the following innovative elements:

1. Standardisation of handover training in Europe
2. Creation of an interdisciplinary and cross-country online learning environment
3. Use of mobile applications to structure the handover process and increase the effects from learning to the medical practice
4. Implementation of the study module in Germany, Spain and Ireland
5. Development of commercialisation and a business plan of the study module.

PATIENT brought together a consortium of partners from medical education schools and technology-enhanced learning research institutes across several European countries as well as an enterprise partner in this field (Table 1). PATIENT combined the expertise of partners to formulate a European study module, which specifically addresses the unsolved problem of fragmented and very limited available handover training. The involvement of a small and medium-sized enterprise (SME) partner during the development and delivery of the study module ensured the knowledge transfer from academia to potential commercial stakeholders in the medical domain.

Table 1: List of Partner Organisations

Partner	Role	Organisation	Acronym	City	Country
P1	Applicant	Open Universiteit Nederland	OUNL	Heerlen	Netherlands
P2	Partner	University College Cork	UCC	Cork	Ireland
P3	Partner	RWTH Aachen	UKA	Aachen	Germany
P4	Partner	Fundacion Avedis Donabedian	FAD	Barcelona	Spain
P5	Partner	MT – Consulting GmbH	MT	Rodgau	Germany

2. Project Approach

The PATIENT project perceived itself as an implementation project. The project can be called successful when the various initiatives on handover are combined in a unique curriculum that can be added to existing patient safety courses in Europe. In order to do so, we took advantage of major achievements from previous projects and initiatives to gain the best educational intervention that is possible. Thus, knowledge gained from the previous FP7 HANDOVER project, and other developments such as the CLAS App, and the WHO Patient Safety curriculum were considered in the development of the PATIENT approach for Europe. We conducted thorough empirical studies (WP2 report on training needs analysis, WP3 report on required learning outcomes) to address the needs of the European stakeholders and then addressed those needs with the most effective and efficient training interventions.

The previous FP7 HANDOVER project had raised the profile of the issues in relation to handover at a global level. This provided PATIENT with a framework in which to approach the design and implementation of handover training in medical education at undergraduate

level. Whereas the previous FP7 HANDOVER project¹ developed a generic training structure and provided an overview of existing handover procedures (Kicken, Van der Klink, Barach, & Boshuizen, 2012), PATIENT developed a concrete study module (WP4 - the handover curriculum) that can be combined with existing patient safety courses in Europe and is available in English, German and Spanish. Beyond those activities, PATIENT also further developed existing intervention tools like the Handover Toolbox, the CLAS app and also developed new tools (e.g. e-DL App, SimHand App, e-Learning course and pocket cards, see section 3.5) and concepts to train handover in Europe.

PATIENT is the first project that developed such a curriculum for undergraduate medical education in Europe. The pressing need for this is supported by a very recent academic paper published in August 2014 in *Medical Teacher*, stating in the conclusion that: '*medical schools should incorporate handoff training as required instruction*'². PATIENT already addressed this need for developing handover training and also evaluated the training courses and tools for this new curriculum at the several partners' institutions, i.e. UKA in Germany, the School of Medicine in UCC in Ireland, and at Fundacion Avedis Donabedian (FAD) in Spain. One achievement of PATIENT is therefore to have combined earlier initiatives and best practices for handover and to make them available in one training package in three languages (EN, DE, ES) to various medical schools in Europe. Another achievement is the development of additional training tools that enrich and standardise the handover training package.

PATIENT started in October 2012, when OUNL invited all partners to a kick-off meeting in Heerlen, the Netherlands, where the whole consortium reviewed the project's objectives. At the kick-off meeting, each work package (WP) was presented by the responsible lead partner: WP1 – Management (OUNL), WP2 – Needs Assessment (FAD), WP3 – Learning Outcomes (UCC), WP4 – Development (UKA), WP5 – Implementation (UKA), WP6 – Quality Assurance (OUNL), WP7 – Dissemination (UCC), WP8 – Exploitation (MT). In addition, each responsible partner presented a timeline for achieving the objectives of the WPs and their contribution to the overall project objectives. The partners were asked to present the latest research and developments with regard to the PATIENT project's objectives that might be beneficial for the project.

At the kick-off meeting, OUNL presented the internal project management software "Basecamp", and the online video platform "Flash Meeting" for the bi-weekly online project meetings. In addition, OUNL introduced the initial policy document for the quality assurance (WP6) and introduced the financial and scientific reporting templates.

FAD took the lead in WP2 - the needs assessment survey for medical staff and students at UKA, UCC and FAD. The survey study was completed in May 2013 and involved 677 students and 52 teachers from 3 countries.

UCC and OUNL outlined the research on learning outcomes for the handover study module within WP3. They conducted a study on learning outcomes via a Group Concept Mapping (GCM) method that was completed in September 2013. The GCM enables teachers and clinicians to rate their opinions on key learning outcomes arising over the course of the study

¹ <http://handover.eu/library/4,p3.html>

² <http://informahealthcare.com/doi/abs/10.3109/0142159X.2014.947939>

module. In total 45 experts contributed to brainstorming on the most important learning outcomes, which produced 112 unique handover competences. 22 of the experts grouped the competences into clusters and rated them according to importance and difficulty.

UKA led WP4 – Development and WP5 – Implementation of the educational material. The overall objective of WP4 was the development of a curriculum that combines all PATIENT teaching materials and tools in a coherent but flexible didactical concept. The final version was delivered on time in May 2014 and is available on the PATIENT website. WP5 aimed at training the trainers for the new study module and preparing the lectures and tools for the training. Furthermore, three pilot studies were included in WP5 to evaluate the new study module before it rolled out to the medical students in Ireland, Spain, and Germany.

MT led WP8 – Exploitation - in the last months of the project. It identified most attractive outcomes of the project and described them as products for new stakeholder groups. MT further investigated the possibilities within the consortium for the commercialisation of the PATIENT products. The results show that the PATIENT products are highly appreciate and address pressing demands for patient safety and especially handover training in Europe. Based on those findings MT created in close cooperation with the consortium a business and exploitation strategy that can facilitate the establishment of a *PATIENT foundation*. The aims of the PATIENT foundation will be to maintain and further develop the PATIENT products and offer it to new medical professionals.

There have been several other PATIENT developments, which were running in parallel to the actions mentioned above. Firstly, a full dissemination plan was written by UCC describing the essential components of WP7 such as the project's website, logo, flyer, blogging strategy, social media channels such as Facebook, Google+, LinkedIn and Twitter, and relevant scientific conferences and journals for the presentation of the project's outcomes. Secondly, OUNL has created a full quality assurance plan to ensure that PATIENT meets its objectives whilst maintaining a high standard of delivery (WP6). Thirdly, there have been five successful international PATIENT meetings and seven workshops at conferences, which facilitated face-to-face discussions with stakeholders and within the project's team.

By following this approach, all objectives of the initial project work plan have been achieved in a timely manner. Among the project and work package reports, PATIENT delivered seven tangible products that are promoted on the PATIENT website³. The following sections (2.1 to 2.6) provide a breakdown of the core elements conducted.

2.1 Needs Assessment Survey (WP2)

A systematic survey was designed in order to chart current knowledge and practice in learning and teaching good handover practices. This survey focused on curricular expectations and questions like:

- What is a good handover practice?
- Which competences are needed for good handover practices?
- What are the current hurdles for good handover practices?
- What are good delivery methods for the new study module especially with respect to

³ http://patient-project.eu/?page_id=120

technology-enhanced learning methods?

Two surveys (one for students and one for teachers) were developed and distributed among the participants to identify the training needs of the students for handover training. Both surveys had the same questions but were slightly adapted to the target stakeholders. The survey content was built upon a literature review, an experts' consultation, and previous project experience (i.e.: FP7 HANDOVER project).

The surveys were tested and fine-tuned in close collaboration with the project partners and selected students before they were distributed to the target population at UCC, UKA, and FAD. The main findings of the survey are summarised in section 3.1. The final questionnaires can be found in the needs assessment report of WP2; a public summary, with the main findings is available in the online library of the PATIENT website⁴.

2.2 Learning Outcomes Study (WP3)

For the Learning Outcomes Study, we applied the Group Concept Mapping (GCM) method to identify the most relevant learning outcomes. GCM is an integrated mixed research method that applies a structured approach to objectively identify an expert group's common understanding about a particular issue (Stoyanov et al., 2012). In the PATIENT project case, GCM was used to identify and negotiate expected learning outcomes for the study module. GCM integrated input from a range of sources such as from the needs analysis report of WP2 and invited experts for the GCM brainstorming session on learning outcomes. Multivariate statistical analysis (multidimensional scaling and hierarchical cluster analysis) reveals patterns in the collected statements. Consensus is not forced as each participant can individually cluster and rate the learning outcomes according to their expertise. During the analysis the opinions are combined to a complete picture of relevant learning outcomes for the handover study module.

With regard to PATIENT, GCM was applied as a tool to consolidate the learning outcomes of the particular module, to prioritise them, and to draw effective measures for their implementation in practice. 45 experts from within and outside the consortium contributed to generate ideas based on the following statement:

“One particular outcome of the handover study module is....”

Subsequently, each participant was given the list of ideas collected and asked to sort them into categories that make conceptual sense. In addition, the participants was asked to rate the ideas based on some values (e.g., importance, difficulty). The analysis identified the shared vision and differences between the three implementation sites (UCC, FAD and UKA) on the module's learning outcomes. This approach supported the project in the development of educational material on the agreed learning outcomes. Specifically the GCM tool supported the following 5 objectives:

1. Prioritise learning outcomes and clusters them to groups
2. Indicate areas of the module where students perceive the greatest learning effect
3. Examine the consensus between different stakeholders' groups

⁴ http://patient-project.eu/?page_id=19

4. Help the PATIENT team to plan short and long term actions for the development of the study module
5. Ensure that the learning outcomes of the handover study module have been developed and validated in close cooperation with the stakeholder groups.

The main findings of the GCM study are summarised in section 3.2.

2.3 The handover curriculum and educational materials (WP4)

The overall objective of WP4 was the development of a curriculum that combines the different handover training tools into a coherent but flexible didactical concept. The WP3 report very efficiently supported us in agreeing on shared learning outcomes. But the practical operationalization of these learning outcomes has shown to be much more difficult due to various national needs and local contexts. We therefore decided to use the overarching learning outcomes as shared objectives for the training but leave each national partner with the flexibility to design the training materials to their local needs. The final version of the curriculum can be downloaded from the PATIENT website⁵ in three languages (EN, ES, DE). Next to the didactical concept we develop various teaching and learning tools that can be used within but also beyond the project consortium.

Next to the didactical concept we develop various learning materials and scenarios that can be used by any partner within but also beyond the project consortium. For instance, we translated the CLAS app into German, Spanish and Catalan and also made it available not only for iOS devices but also for Android devices. In that way we were able to cover almost all students at our application sites with the CLAS app so that they could just install the app on their own mobile device in their own language.

The CLAS app and the agreed learning outcomes from the WP3 report provide a common ground for standardisation of handover processes within Europe. When all medical students are trained to the same learning outcomes and use the same checklist, like the CLAS App, to conduct their handovers, a much more accurate and secure handover procedure can be achieved within Europe. This will directly result in fewer patients harmed in clinical practice.

A total overview of the developed tools can be found in section 3.5 and in the exploitation report (D8.01).

2.4 Implementation of the handover study module (WP5)

There are many challenges to implementing an interdisciplinary European handover training curriculum, and to incorporating this training into an existing undergraduate module, as envisaged in the PATIENT project. These include developing the curriculum across different institutions, modules and programs, and ensuring compatibility of the training, and feasibility of implementation in different countries. For the initial implementation phase PATIENT tested the handover training materials with smaller pilot groups at each implementation site. Pilot studies in Germany, Ireland and Spain inform the rollout of the curriculum to a wider student population. The implementation of the module at the three different sites is described in detail in Section 3.4.

2.5 Quality assurance (WP6)

The purpose for quality assurance WP was to ensure that project procedures and

⁵ http://patient-project.eu/wp-content/uploads/2012/10/PATIENT_WP4_curriculum.pdf

deliverables are completed to an high quality standard and that the quality policy of the project is distributed among the partners and applied in a efficient manner. The quality management plan identified various responsibilities and leaderships that have been explicitly allocated to the project partners. The detail monitoring of the quality of the project results can be found in D6.02 quality report.

2.6 Dissemination (WP7)

The PATIENT project had a clear and coherent strategy for the dissemination of its findings. A framework to inform this process was adapted from the outset. In developing this strategy we explored possible synergies with other patient safety projects. The AHRQ (Australian Agency for Healthcare Research and Quality) developed a framework called the Framework for Transfer of Patient Safety Research into Practice. Based on this AHRQ Framework we structured our plans in terms of considering the major components of dissemination: packaging research results, identifying target users, engaging connector organisations, identifying barriers, developing success measures, and allocating resources to implement the plan.

Responsibility for the dissemination and exploitation of the project involved each consortium member in their capacity as the repository or owner of those results. All project partners have taken an active part in bringing into effect the measures set out in the dissemination and exploitation plan. Our dissemination process was not designed to be seen as the exclusive reserve of those partners who offered specific discipline expertise, marketing expertise or dissemination capacity.

In our dissemination process we used a wide variety of channels, e.g. publications and reports, Web sites and other electronic communications, meetings and conferences, social networks, person-to-person communications, formal collaborations or information networks. As in a project of this nature the particular processes for dissemination impacted at different stages of the project so website and social media processes were evident from the outset whereas substantive academic papers only became evident towards the later part of the project or after the project's completion. We considered all of the channels listed below in Table 2 to ensure that the widest possible audience could be exposed to our research findings or our training module in such ways that both are accessible and easy-to-use. Cost and cost-effectiveness were obviously important considerations in choosing the correct channel for dissemination.

Table 2: Channels for Dissemination

Broadcast media	Personal contact
Academic journals	Academic detailing
Book chapters	Clinical specialty associations
Technical reports	Informal professional networks
Regular newspapers	Professional conferences
Special interest newsletters	Professional meetings (e.g., grand rounds)
Radio or TV interviews	Workshops and other CME/CNE training
Interest group list	Participating in improvement collaborative
Web sites & Social Media	

2.6.1 Project Website

The project website was presented in detail in the first public report. Since then the website has been further matured and maintained.

The PATIENT website (screenshot shown in Figure 1) is still our primary dissemination route through which PATIENT is presented. The public website serves two distinct dissemination functions. Firstly, it provides a forum for presenting the latest project related information. Secondly, it also raises awareness of the PATIENT project for those searching the Internet for specific keywords (e.g. patient safety, patient empowerment, medical apps, handover, mobile devices in health, knowledge triangle, health2.0 etc).

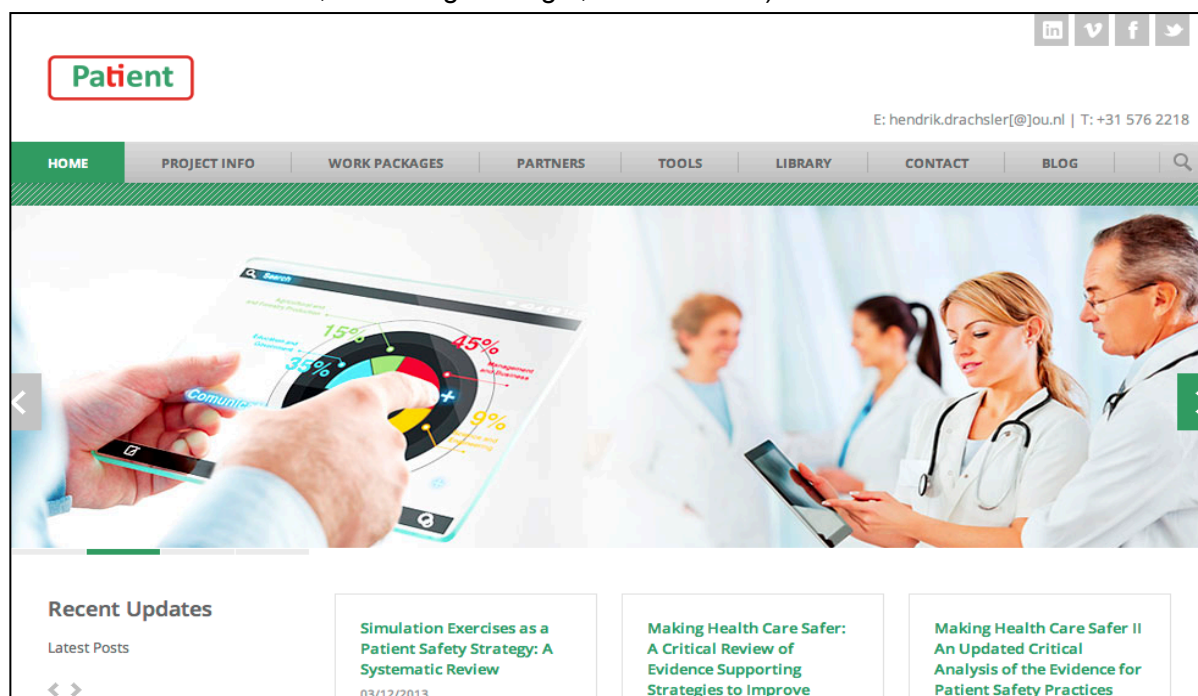


Figure 1: Screenshot of the PATIENT website

As shown in Figure 1, the project website is connected to various social media channels such as Facebook, Twitter, LinkedIn, and the video platform Vimeo. Any blog posting is directly forwarded to the project's Twitter, Google+ and Facebook account, which increases the virality of the information and guarantees that the direct approach of the stakeholder groups of the project.

On the project website interested visitors can find a broad scope of information, namely:

- 1. A general description of the project ([LINK](#))
General project description with work packages that represent the PATIENT project approach. In addition, latest developments, activities, and news are blogged by WP7 Dissemination and sent over the website to Facebook and Twitter (<https://www.Facebook.com/PatientProject> / <https://Twitter.com/patientproject>).
- 2. Summaries of the empirical studies ([LINK](#))
The summaries⁶ are publicly available to external parties and provide insights into the two empirical studies (WP2 and WP3) that the PATIENT project conducted in the

⁶ http://patient-project.eu/?page_id=19

first year. The findings have been used to design the handover study module according to the needs of the students and the expertise provided by handover experts.

- 3. A video library with experts and training videos on the topic ([LINK](#))
The visitors of the webpage can watch a collection of expert videos regarding the importance of handover training. These videos have been made during the FP7 HANDOVER project and are not initially produced by PATIENT. The PATIENT consortium extended this initial library with own videos that are also used in our teaching lectures. (<http://vimeo.com/user7381178>).
- 4. Information about the handover tools developed ([LINK](#))
The website provides initial information about the handover study module and the different tools we have developed for such as the CLAS and e-DL, SimHand App, and the Handover Toolbox, e-Learning Course and the PATIENT pocket cards.
- 5. Publications & Dissemination materials ([LINK](#))
A first PATIENT flyer was produced by UCC in July 2012. This document was circulated to all partners in electronic and paper format. It was used as a way of communicating the project objectives and procedures to potential consumers, particularly medical business and relevant HEI and research institutions. In 2014 we updated this flyer with a new version that is also given to the students participating in the new study module. All publications (2 awards, 2 journals, 14 conference papers, and 7 stakeholder workshops) are listed on the project website as well.
- 6. The PATIENT library ([LINK](#))
The consortium created a virtual library around the core research articles on the handover topic. The library contains the bibliography used in our reports and articles. It is an open group created at the Mendeley reference platform and will continue to be enriched with additional references
<http://www.mendeley.com/groups/2554171/patient-handover/>

We are encouraging external parties to sign up for this group and to connect to the community of people working on these topics by gaining access to the collected bibliography but also by contributing with new relevant publications in this important field of research. There are currently 143 research papers included in the Mendeley Patient-Handover group.

As shown on the world map in Figure 2 and 3, the PATIENT website was well received by international audiences that are interested in the handover topic. Since the last year report the project has had a significant international reach, with over 10400 unique visitors to the project website.

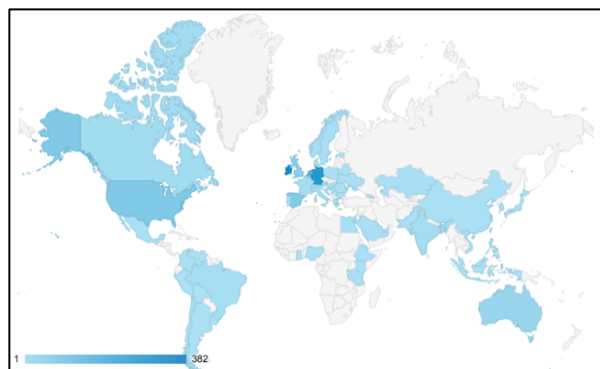


Figure 2: Visits to the PATIENT website from around the world in October 2013 max value 382 from one country (dark blue = highest amount of visits)

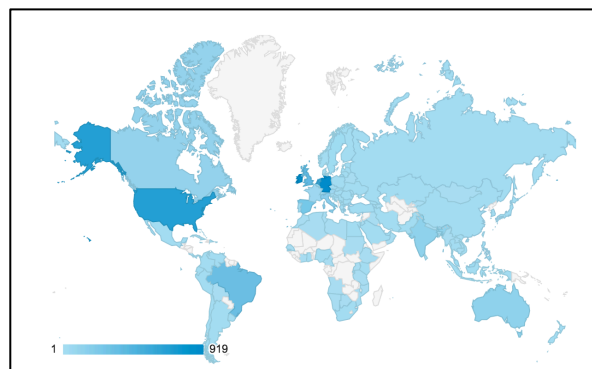


Figure 3: Visits to the PATIENT website from around the world in March 2015 max value 919 from one country (dark blue = highest amount of visits)

An deeper analysis of the cities that have been most interested in the PATIENT outcomes showed a huge interests in Africa from the region that have been affected by Ebola (see Figure 4). We hope that the PATIENT outcomes could resolve the dramatic situation in those countries and made some patients being less harmed.

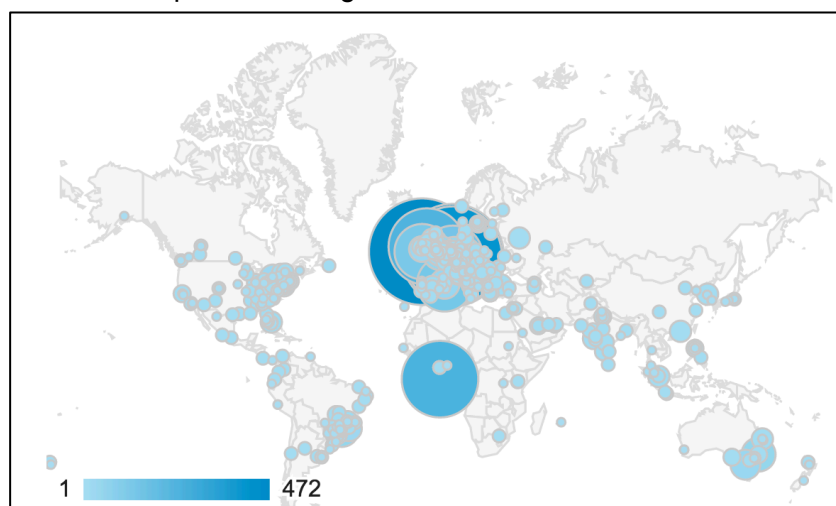


Figure 4: Visits to the PATIENT website from the main cities in the world from March 2015 max value 472 from one country (dark blue = highest amount of visits).

2.6.2 Social Media

Within PATIENT we follow the social media handbooks for LLP projects developed by the LLP Project web2llp.eu. In 2013, the LLP Project web2llp.eu presented their handbooks at the annual project meetings organised by the EACEA agency and advised that LLP projects should disseminate their outcomes over social media channels. We therefore asked our technical partner to follow up on this advice and integrate all relevant social media channels into the project website according to the web2llp handbooks.

In 2014, the PATIENT website was used as a best practice example during the annual project meeting in Brussels for our usage of social media and the adoption of the web2llp handbooks within the project. We are proud that we were able address the aims of the agency in such a sufficient manner.

According to the web2llp.eu handbooks our project website acts as a central information hub. It is connected to social media channels like Facebook, Twitter, Google+, LinkedIn, and the vimeo.org video platform. Any blog posting is directly forwarded to the social media channels, which increases the reach and virality of the information and guarantees that people interested in the project are reached.

With this modern communication approach we hoped to reach a) more stakeholders and b) the students subscribed to the handover module in the three European countries involved (Germany, Ireland, and Spain). Within the Dissemination WP, we considered the use of social media channels to involve the students in the evaluation of the study module. An example of our social media use is shown in Figure 5 below.

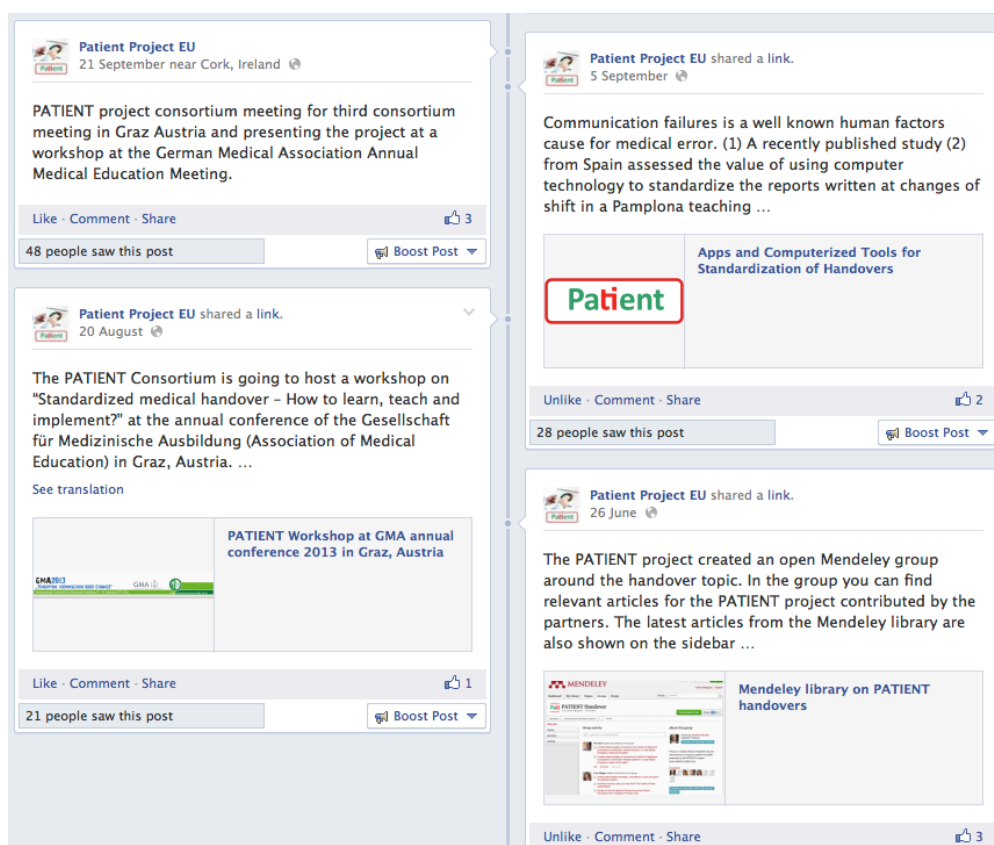


Figure 5: Screenshot of the timeline of activities of the PATIENT project on Facebook

2.6.3 Publications

Publications at international conferences and in scientific journals especially attracted academic stakeholders of the project. Until March 2015, the consortium has won 2 innovation awards, published 2 journal articles (2 under review), has given 14 presentations at national and international conferences, organised 7 stakeholder workshops, and created 92 blog posts, 8 new videos for the handover video library, created 11 WP reports, and created a Mendeley library with 140 research articles about the handover topic (<http://www.mendeley.com/groups/2554171/patient-handover/>).

We presented our findings at the World Conference on Mobile and Contextual Learning (Helsinki 2012), the World Congress on Social Media, Mobile Apps, Internet/Web 2.0 (London 2013), the Annual Meeting of the Society for Medical Education (Aachen 2013), the Association for Medical Education in Europe (Milan, 2014), the International Forum for

Quality and Safety in Healthcare (Paris, 2014), and the German Medical Association (GMA, Graz 2013 and Hamburg 2014).

A journal article was published in the *International Journal of Mobile and Blended Learning* and another has been published in *Academic Medicine*. A number of journal articles are in preparation based on the WP2 and WP4 and WP5 empirical findings, and on the development of the e-DL app. Furthermore, the CLAS app won the Crystal Clear MSD Health Literacy Award 2013 (see further details in section 3.5.2), and the e-DL app won the LinkedUp competition (see section 3.5.3). A workshop devoted to implementation of the study module was given at the GMA conference in September 2013 in Graz, Austria and in 2014 at GMA 2014 in Hamburg, Germany.

We are particularly pleased regarding the article describing the learning outcomes study, which was accepted by *Academic Medicine*. This journal, published by the Association of American Medical Colleges, has the highest impact factor of all the medical education peer-reviewed academic journals (3.5).

2.6 Exploitation (WP8)

Within the last months of the PATIENT project, the partners intensively worked on an exploitation and business strategy to continue working on the outcomes of the project after the funding period ended.

MT led and summarised those considerations in the WP8 Exploitation report. The main objectives of this report were to describe how the innovative teaching and learning materials developed within the PATIENT project can be utilised within the PATIENT consortium and how these resources can be marketed to new stakeholder groups. We identified four main exploitation objectives and agreed on those in the last consortium meeting in March 2015, Cork, Ireland:

1. Cover costs for maintaining the PATIENT products
2. Generate income to further develop the PATIENT products and training tools
3. Establish a 'Handover Certificate' accredited in Europe as certification of good handover practices
4. Establish a legal entity – PATIENT foundation – that can support new stakeholder groups in implementing the PATIENT outcomes within their environments.

In order to achieve these objectives, the consortium contributed to a Business Strategy Survey (BSS) designed by MT to investigate the potential within the consortium to develop a business strategy and provide a roadmap towards achieving the identified exploitation objectives. Based on the outcomes of this survey and negotiations at the final consortium meeting, a concrete plan has been developed how the PATIENT consortium can use the outcomes of the PATIENT project and commercialise those for the European health market (see Annex 9 WP - D8.01).

The report concludes with a strategy to establish a PATIENT foundation that will maintain, further develop, and offer professional certified courses based on the PATIENT outcomes to new stakeholder groups. A first course will be organised at the partner UKA in Aachen, Germany in July and September 2015.

3. Project Outcomes & Results

Table 3 provides a summary of PATIENT deliverables from October 2012 to March 2015. Each of the relevant deliverables has been delivered on time and uploaded to the outputs section of the project's website.

Table 3: Summary of PATIENT Project Deliverables and products (October 2012 – March 2015).

Summary of Deliverables			
Deliverable number	Deliverable title/description (max 200 characters)	Work package most contributing to this deliverable	Date completed
M1.01	Establishment of Executive Board	WP1	April 2013
D1.01	Annual Reports According to Reporting Guidelines	WP1	October 2013
D2.01 / D2.02	Full Needs Assessment Survey Report	WP2	April 2013
D3.01	Generation of WP3 Report Document	WP3	October 2013
M6.01	Development of Quality and Assessment Plan	WP6	April 2013
M6.02	Recruitment of Expert Advisory Panel	WP6	April 2013
D6.02	Interim QA Report	WP6	April 2014
M7.01 M7.03	Establishment of Project Website	WP7	November 2012
M7.02	Dissemination Plan	WP7	April 2013
D4.01	Handover Curriculum and educational Material	WP4	May 2014
D5.01	WP5 Progress Report	WP5	January 2015
D6.02	WP6 Quality Assurance Report	WP6	March 2015
D7.01	WP7 Dissemination Report	WP7	March 2015
D8.01	WP8 Exploitation Report	WP8	March 2015

Among the deliverables is a broad range of products that has been released. Table 4 provides a summary of PATIENT training tools developed from October 2014 to March 2015. Among the initial further developments of the Handover Toolbox and the CLAS app, we are proud to also present the e-DL App, the Pocket Cards, the e-Learning course and the SimHand App in the product portfolio of the PATIENT project. Those rich results have been possible due to the great atmosphere within the project, passion about the topic, and hard work.

Table 4: Summary of PATIENT products (October 2014 – March 2015).

PATIENT products	
WP4	e-DL app (February 2014) - http://patient-project.eu/?page_id=95 - https://play.google.com/store/apps/details?id=org.celstec.edlapp
WP4	CLAS app ML (April 2014) - https://play.google.com/store/apps/details?id=org.welten.clas_v_1&hl=en - https://itunes.apple.com/de/app/clas-app-ml/id896607128?l=en&mt=8
WP4	Handover Toolbox 2.0 (July 2014) - http://www.patient-project.eu/toolbox/
WP5	Pocket Cards (September 2015) - http://patient-project.eu/?page_id=1285
WP5	E-Learning Course (November 2014) - http://patient-project.eu/?page_id=1314 - http://patient-project.eu/?sfwd-courses=patient-handover-module
WP5	SimHand app (First version August 2014 , all scenarios integrated in January 2015) - http://patient-project.eu/?page_id=1292 - https://play.google.com/store/apps/details?id=org.celstec.arlearn2.android.handover&hl=en

3.1 Summary of the Needs Assessment Survey

The main findings from the PATIENT needs assessment survey can be downloaded from the project website⁷.

The survey was structured within the framework of 4 handover-related dimensions assessing the opinion of the respondents about:

- The importance of and skill abilities related to handover
- Experience in clinical practice
- Curriculum content
- Preferences about handover and level of confidence related to learning environment.

The in-depth analysis of all the items from each dimension enabled the project to compare results among students and academic staff as well as countries. The results reflect the needs of the students in regard to the handover process, as well as identification of the teaching priorities that are considered useful for addressing learning outcomes and designing the study module.

3.1.1 Demographics

The survey study was completed in May 2013 and involved 677 students and 52 teachers from 3 countries as shown in Figure 6. With some delay due to external reasons, we are currently preparing a publication on the study results for an international journal.

⁷ http://patient-project.eu/?page_id=19

Country	Student Survey			Academic staff survey		
	Surveys Distributed (n)	Surveys Completed (n)	Response Rate (%)	Surveys Distributed (n)	Surveys Completed (n)	Response Rate (%)
Ireland	495	262	52.9	50	19	38.0
Germany	515	240	46.6	80	10	12.5
Spain	481	175	36.4	120	23	19.16
Total	1491	677	45.4	250	52	20.8

Figure 6: Screenshot of response rate per survey type from WP2 report.

3.1.2 Survey results

The main findings and priority areas related to study needs of medical students on handover are summarised below:

- There is a consensus among students on the skills and knowledge important for handover training and specific areas that need to be prioritised.
- Students are keen on using e-learning resources for knowledge acquisition, but acknowledge that handover training requires a certain amount of ‘hands-on’ experiential learning.
- Students identify team-working and inter-personal skills as areas they wish to receive training in, and it would be wise to address these concerns, as they are prime causes of medical mishap.
- Simulation could be useful for handover training, but both students and teachers have limited experience in this area.
- Improving students’ induction into the clinical environment, helps for their adaptation, increases their knowledge of the policies and standards of clinical practice at local level and encourages and engages students to be more active in communicating with healthcare professionals during their clerkships.
- Medical students need to be taught about handover processes and to learn key skills important to handover.

3.1.3 Main findings

Interventions that should be addressed are:

- Improve students’ skills in the management of stress and critical situations, conflict resolution, responding to medical errors.
- In terms of behaviours, students should be able to conduct and monitor the whole discharge process, patient follow-up process with other providers and other levels of care, overall referrals processes, also performing a correct (and safe) handover communication with other team professionals (non-medical).
- From the knowledge perspective, the curriculum should provide sufficient room for improvement in areas such as the use of standardised strategies for patient registration, patient referrals and medication, reviewing the correct handover protocol and procedure and the use of standardised tools as checklists.

This analysis has enabled us to identify key features integral to handover educational programs, which will contribute to the success of the study module development and its acceptability for students and academic staff.

3.2 Summary of the Learning Outcomes Study

The WP3 learning outcomes study applied the Group Concept Mapping (GCM) approach. It is an integrated mixed research method that applies a structured way to objectively identify an expert group's common understanding about a particular issue (Stoyanov et al., 2012). In the case of the PATIENT project, GCM was used to identify and negotiate expected learning outcomes for the handover study module.

This section describes the purpose, the method for data collection, structuring and analysis, and the results from an online experts' consultation on the learning outcomes of the handover module, conducted within the framework of the PATIENT project. The online consultation is aimed at facilitating a group of experts to (a) collect opinions on expected learning outcomes of the handover module, (b) structure the ideas generated, (c) identify a group of issues, trends, or challenges related to handover learning outcomes, (d) show how the ideas are related, and (e) prioritise these ideas. It was expected that the empirical evidence produced would inform the decision making on selecting and operationally defining learning outcomes in a later stage of the project.

3.2.1 Demographics

61 participants registered (creating a username and password) to the system for online data collection that supports the GCM approach. They gave their informed consent to participate. Of those who registered, 45 contributed effectively to the brainstorming session and 22 completed the sorting and rating phases. 45 participants generated 204 ideas, which for a topic such as learning outcomes of a module on handover is considered a good result. 107 ideas remained after idea cleaning, editing and synthesis.

3.2.2 Clustering results

Figure 7 shows the first outcome of the multidimensional scaling – a point map. The two-dimensional graphical configuration represents the learning outcomes (as points on the map) and shows how they are related. The closer the points are to each other, the closer in meaning they are. This is a result of more people grouping them together during the sorting.

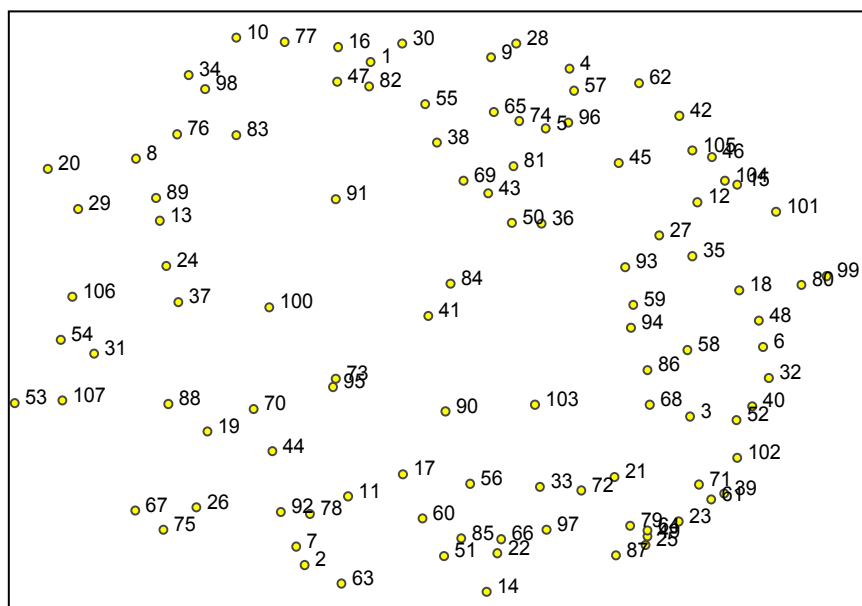


Figure 7: Point map showing the position of all statements after multidimensional scaling

Based on the replay map (see Figure 8 below) we prepared a checklist with the suggestions made by the hierarchical clustering analysis for merging clusters and asked a small group from the consortium to help with deciding upon the 'best' fitting solution. At each step of the merging the participants had to indicate whether they 'agreed', were 'undecided', or 'disagreed with the suggestion. In deciding if they should merge two clusters (or keep them together), we advised them to think about how easy or difficult it would be to 'name' or label that cluster with an overall theme that captures the majority of the statements' content.

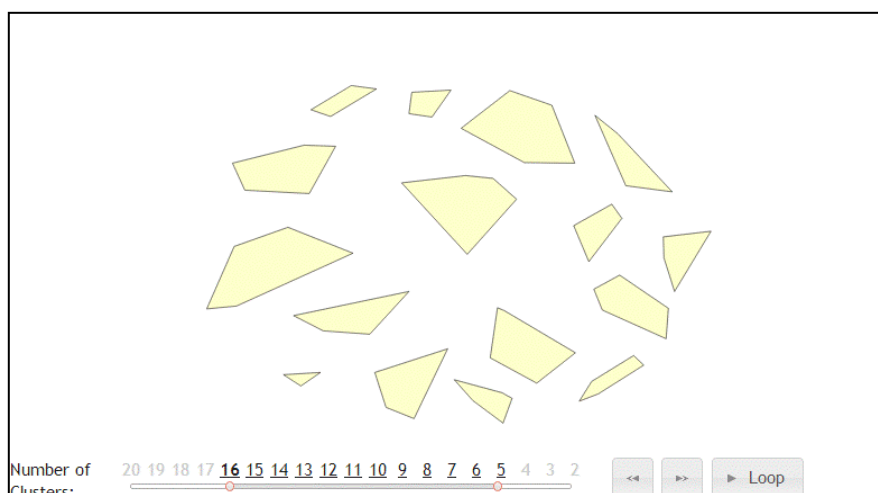


Figure 8: Replay map shows initial 16-cluster solution

After completing the assignment, the analysis team looked at their worksheets to determine the final solution for clustering the learning outcomes. In the end the 10-cluster configuration was selected as the 'best fitting' solution (see Figure 9).

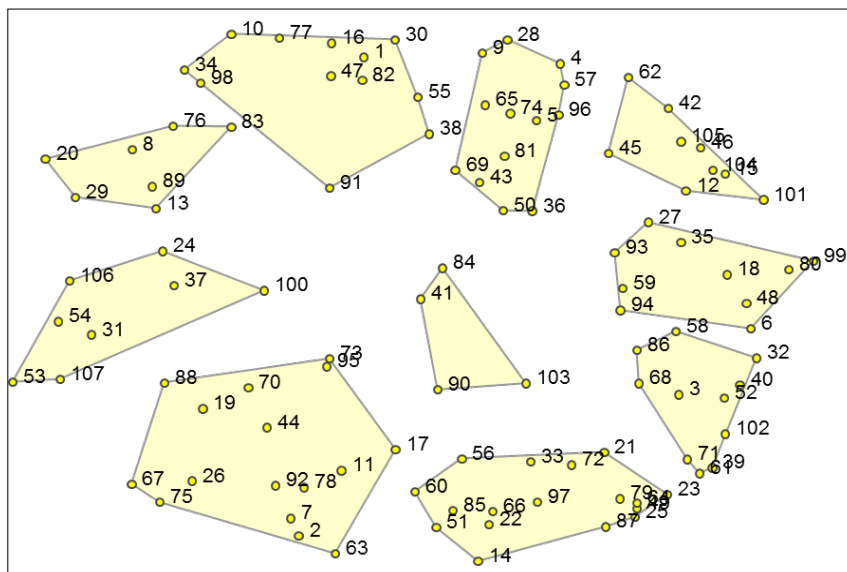


Figure 9: The 10-clusters solution

The next step in making sense of the data was to attach meaningful labels to the clusters. The following clusters were identified:

1. Use of handover tools,
2. Perform handover in real settings,
3. Enable handover accuracy,
4. Perform handover in simulated environment,
5. Learn how to communicate,
6. Prepare clinical documentation,
7. Collaborate with colleagues, patients, carers,
8. Identify errors and risks,
9. Understand effects of handover, and
10. Clinical performance

3.2.3 Rating results

Figure 10 also visualises how the participants rated the clusters on “Importance”.

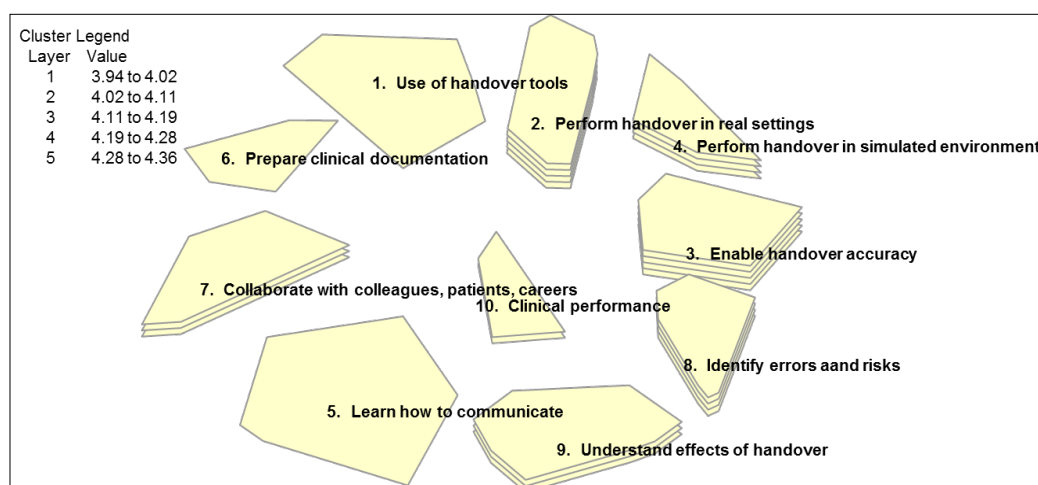


Figure 10: The 10-cluster map on Importance

The highest score was received by the clusters ‘Perform handover in real setting’ and ‘Enable handover accuracy’ with five layers each, followed by ‘Perform handover in simulated environment’ with 4 layers. ‘Understand effects of handover’ and ‘Collaborate with colleagues, patients and carers’ got 3 layers. ‘Clinical performance’ got 2 layers and ‘Use of handover tools’; ‘Prepare clinical information’ and ‘Learn how to communicate’ scored the lowest with one layer each.

In the full WP3 report, we also describe the rating for Difficulty and correlate both rating data sets with each other to get further insights into the implementation of the learning outcomes in short and long term.

3.2.4 Main Findings

- The PATIENT GCM study identified learning outcomes not only for a single module on handover but also for a whole curriculum on handover that gradually can be developed in the future.
- The GCM study depicts areas of interest/themes from which to select learning outcomes and operationally define them. The study suggests what we could expect from learners in terms of knowledge, skills and attitudes but the level of these categories needs to be determined (e.g. using taxonomies in cognitive and affective domains).
- In contrast to the traditional position on learning outcomes seen as only expected results of the teaching and learning, the current study emphasised the need to consider also the means to achieve the learning outcomes (see the two clusters on performing in simulated and real settings).

- The results of the current study are in line with some other studies on the handover topic (Kicken et al., 2012; Stoyanov et al., 2012). It identifies similar issues such as handover tools, standardisation, communication, and collaboration but at the same time it extends the scope of handover topics and teaching methods.

We are proud that the findings of the Learning Outcomes Study have been accepted as being a highly innovative contribution to the medical field and have recently been accepted for publication by *Academic Medicine*, a journal published by the Association of American Medical Colleges. This journal has the highest impact factor of all the medical education peer reviewed academic journals (3.292).

3.3 Summary on developing the curriculum and educational materials

On the basis of preceding reports from WP2 and WP3, we developed a “Curriculum for Handover Training in Medical Education” in WP4 (available on the project’s website⁸).

From the WP2 report we knew that medical students are interested in online learning courses and mobile apps, but also would prefer those materials to be available in their own language. That motivated us to customise the Handover toolbox and the CLAS app to the local needs of the students while we were developing the instructional design for the handover study module.

The WP3 deliverable (with its clusters of learning outcomes) provided an overview of important learning outcomes that need to be addressed in handover training. In order to transfer and integrate those findings from WP3 into a concept of a curriculum we followed Kern’s principles of curriculum development (Kern et al., 2010). We first developed an educational strategy, and then included teaching methods and materials. In order to address different learner styles and learning motivations as reported in WP2 we used multiple educational methods within the curriculum. Those methods are also congruent to the learning objectives reported in WP3 (e.g. interactive seminar, online-learning, simulations, case-based training, etc.). Furthermore different formats for assessment have been adapted in respect to our learning outcomes and teaching methods. Each partner contributed to the curriculum according to local and personal expertise.

Within this process the curriculum was subdivided into three modules: Module 1 – Risk and Error Management, Module 2 – Effective Communication and Module 3 – Simulation. Each module contains various categories of learning objectives and related teaching material and methods. Each partner took the lead on one of the learning modules and provided various materials from case studies, simulation scenarios, student exercises, presentations, and literature overviews up to detailed checklists for assessment. After collecting all materials and documents, the adaptation and adjustment into a consistent design was accomplished. The final curriculum document went through several internal review phases led by WP6 to ensure high quality of this document.

In May 2014 we provided a 144 pages strong handover curriculum document summarising important resources for handover procedures and handover training, to address patient

⁸ http://patient-project.eu/wp-content/uploads/2012/10/PATIENT_WP4_curriculum.pdf

safety issues. The curriculum is available on the PATIENT website⁹. It is structured into three modules while every single module contains background information and theory with reference to the learning objectives, implementation advice, student activities and links to further literature and information.

As the handover curriculum is a very large document we also developed an instruction guide on how to use the document and select the most suitable training for any local needs. The instruction guide basically reflects the phases of development and implementation which we processed with our team and is also available on the website. The curriculum has been translated into English, German and Spanish.

3.4 Summary on Implementation of the handover study module

As part of WP5 we conducted three pilot studies in Germany, Ireland and Spain to test the developed educational materials and tools for their feasibility and roll out to all students in the fall of 2015. The following sections will report preliminary insights into those pilot studies, which have been completed in December 2014.

3.4.1 The German pilot study

At the University Hospital in Aachen, Germany (UKA), the pilot concept was integrated into an already existing course led by departments for anaesthesiology, intensive care and emergency medicine. Students have 4 weeks of block classes in these departments. The pilot concept was provided through two modules with a focus on handover in the context of communication, error management, patient safety, interprofessionality and teamwork. The delivery of the modules was based on an interactive seminar and a practical handover training accompanied by a longitudinal online module.

During the interactive seminar students received theory and background on patient safety and the connection of handover with error management, communication and teamwork. Students learned about methods, tools, checklists and mnemonics to technically structure a handover as well as ground rules for closed loop communication. Activating elements such as group discussion, short videos and small group exercises were integrated into the didactical concept.

The practical training sessions were based on 6 clinical cases in different settings (ICU, post-anaesthesia, emergency room, and internal medicine ward). Students had to perform handover of these cases in created scenarios such as shift changes, patient transfer, telephone handover etc. Students were provided with a number of optional checklists, tools and supports to structure their handover and could choose freely how to perform it. They received feedback from peers as well as from academic staff. After the training they were given pocket cards¹⁰ to take with them containing diverse options of mnemonics and checklists. The online module integrated the Handover Toolbox with video-based e-learning assignments and tasks such as application of the CLAS app by practicing discharge letter writing (see Figure 11).

⁹ http://patient-project.eu/wp-content/uploads/2012/10/PATIENT_WP4_curriculum.pdf

¹⁰ http://patient-project.eu/?page_id=1285

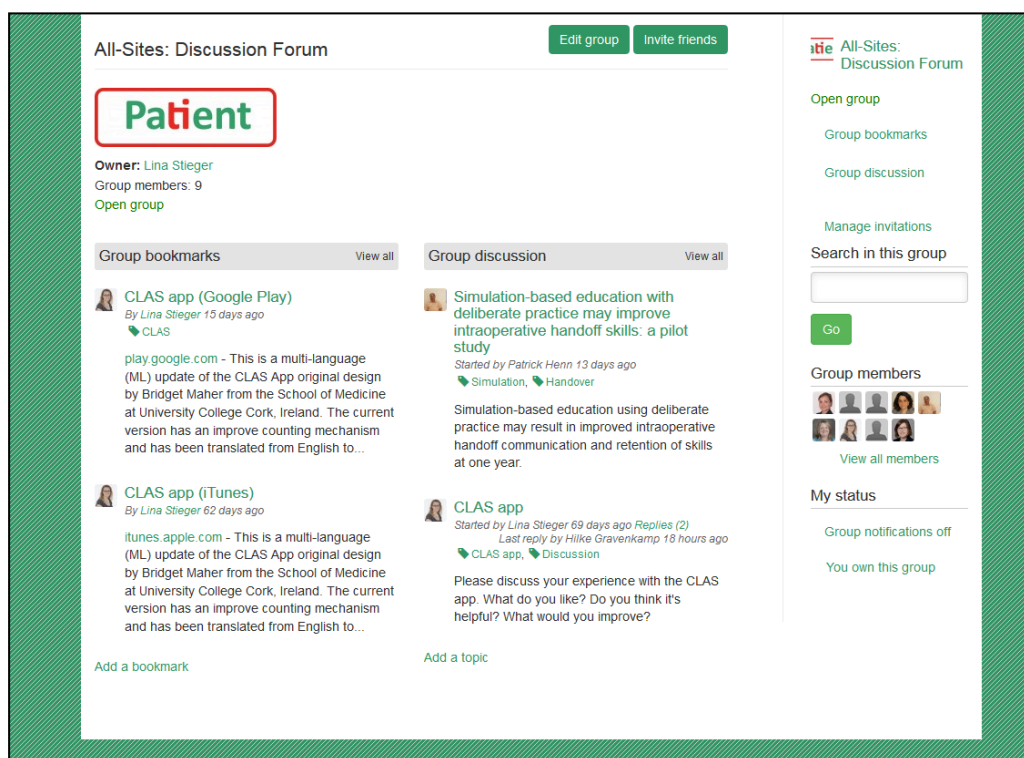


Figure 11: Screenshot of the educational material within the Handover Toolbox.

Students had to answer questions on bad- and best-practice video examples and submit their answers. Also the discharge letter was submitted online to the course organisers and reviewed by them. For cooperative exchange with students at European partner sides, students were asked to post their opinion and experience with CLAS app in a discussion forum, which was integrated into our online tool. Furthermore the attendance of a practical assessment after the course was included.

The seminars and training were delivered by experienced team members of the Aachen Consortium and always included at least one physician with clinical experience and also an academic of communication science or psychologist. The number of participants per seminar varied between 9-12 students.

The pilot concept was constructed with an integrated controlled educational research study in order to compare students without training intervention to those who had received standardised handover training during the pilot course. A questionnaire regarding knowledge and attitudes towards handover and patient safety was used for pre- and post assessment in both groups, as well as a skills assessment.

For practical skills assessment the students received a standardised digital case file and had to perform a handover under standardised circumstances. The handover was videotaped for checklist-based rating.

We started in October 2014 to deliver the modules of handover training to the students until December 2015. The results of the questionnaire as well as the video analysis of handover performance are still being investigated by a researcher. It is the intention to publish two high

impact journals out of these pilot studies, as the PATIENT project is the first European project that conducted those studies.

3.4.2 The Irish pilot study

The pilot study at UCC was led by the 3 UCC PATIENT consortium members Dr Pat Henn, Dr Helen Hynes and Dr Bridget Maher along with substantial support from other faculty members at the School of Medicine namely Dr Robert Gaffney the Director of Clinical Skills, Dr Simon Smith the Director of Communication Skills, Dr Catherine Sweeney Lecturer in Clinical Practice and Ms Theresa Power Clinical Simulation Nurse.

The handover project pilot was devised and constructed to be assimilated into the existing curriculum for final year and third year medical students at the School of Medicine at UCC. The content of the PATIENT curriculum and education materials for handover training developed during WP4 of the project formed the basis of the content material for use with both final year and third year medical students. Educational content was available for online learning to the UCC students through the Handover Toolbox and UCC Blackboard. The pilot for final years was being conducted in module MX5090 (Research and Professionalism in Medicine) and in third year in MX3010 (Mitigating Medical Error). The final year Pilot commenced in October 2014 and the third year pilot in November 2014.

The final year pilot took place in the pre-existing high fidelity simulation facilities in the School of Medicine at UCC namely the Essential Intern Skills syllabus in the high fidelity simulated ward of the Medical Assessment Unit and in the Emergency Medicine syllabus in the ASSERT Centre (Application of Science to Simulation, Education and Research on Training for Health Professionals) (see Figure 12, 13).



Figure 12: The simulated ward of the School of Medicine at University College Cork.



Figure 13: The ASSERT Centre School of Medicine at University College Cork.

The pilot for final year medical students was designed to have an incorporated controlled research educational study. The first groups of students did not have access to the online standardised pre-simulation training educational material for handover. Their performance in handover was compared to a second group of students who had access to the online standardised pre-simulation training educational material through the Handover Toolbox and Blackboard at UCC.

Both sets of students received the current syllabus information before the Essential Intern Skills Simulation and the Emergency Medicine Simulation. The second group received the following additional information. The students were informed in advance of the simulation with respect to the purpose of the simulation, the location of the simulation, the date and the time of the simulations. The students were asked to prepare in advance for the Handover simulation by familiarising themselves with the recommended background reading in Handover and the Learning Outcomes for the Handover Simulation within the Handover Toolbox and Blackboard including the CLAS App. They were informed that they play the role of newly qualified doctors in the simulation. A qualified nurse who played the role of the ward sister in the simulated ward supported the students.

On the morning of simulation training for handover students were met by a member of faculty and briefed on the learning outcomes, objectives and structure of the teaching and learning session. They were informed that the assessment of their performance is formative and that they would receive generic feedback in relation to the scenarios from faculty as a group at the end of the simulation session, and a confidential written copy of a metric based assessment of their performance in the scenarios. In UCC the simulated ward is fitted with audio-visual equipment. This remotely streams video and audio to the desktop computers of faculty observing and assessing the student's performance in the simulation. Students are informed of this before they commence simulation training.

Three scenarios covering handover will occur in the Essential Intern Skills Simulation. In the first scenario the student in the simulated role of a newly qualified doctor is to handover a patient to a faculty member in the simulated role of a senior doctor in a face-to-face situation. In the second scenario the student is in the role of a newly qualified doctor is to handover a patient to a faculty member in the simulated role of a senior doctor via a telephone. In the third scenario the student in the simulated role of a newly qualified doctor is to write a discharge letter to the patient's general practitioner. One scenario will be covered in the Emergency Medicine Simulation, in this scenario the student, in the role of a newly qualified doctor, is to handover a patient to a faculty member in the simulated role of a senior doctor via a telephone conversation.

Students who participate in the second group have been asked to evaluate the handover training using a questionnaire, the participating faculty will also be asked to evaluate the handover training.

The pilot for year three included a scenario again simulation based in which students prepared a discharge from hospital for a simulated patient. They performed a handover via a telephone to a member of the faculty who was simulating a doctor in general practice in the community setting. This pilot was undertaken by the UCC consortium members and with substantial support from Dr Simon Smith Director of Communication Skills and Professor Colin Bradley Professor of General Practice at UCC. The pilot for third year medical students was designed to have an incorporated controlled research educational study. The first groups of students had no access to the online standardised pre simulation training educational material for handover. Their performance in handover was compared to a second group of students who had access to the online standardised pre simulation training educational material through the Handover Toolbox and Blackboard at UCC. Again students

who participated in the second group were asked to evaluate the handover training using a questionnaire, participating faculty was also be asked to evaluate the handover training.

It is the intention that the results of both pilots will be prepared for publication in peer reviewed journals and at medical education conferences as part of the dissemination of the PATIENT project. As the reporting about WP5 has been completed in January 2015, we are still working on the investigation of the results and the research articles.

3.4.3 The Spanish pilot study

The pilot study of the project is developed in the Faculty of Medicine of the Autonomous University of Barcelona, with the participation of the Avedis Donabedian Research Institute team (Carola Orrego and Joaquim Bañeres), the support of the Faculty members at the School of Medicine and collaboration from hospital physicians for practical sessions.

Two modalities have been planned for the pilot study. The first modality was designed to be included into the existing curriculum for 5th year medicine students, specifically for the course of Health Management and Public Health. The completion of the activity was a requirement to pass the course and it has been structured as a seminar format for 15 students. This first modality of the pilot study was structured in 4 modules based on the material developed in WP4 (the handover curriculum) focusing on patient safety, communication strategies, and practices of handover.

The methodology for this module was based on a combination of theoretical and practical sessions (based on simulation exercises and role playing). Readings and additional resources were provided through the Handover Toolbox. In the initial session, students were informed about the general aspect of the seminar, the learning objectives and the main contents that will be addressed. A written evaluation was conducted at this stage with the aim of identifying the students' pre-intervention competences. The general structure of the training modules in the Spanish pilot study is illustrated in Figure 14 below. The first module, with a more theoretical approach, included basic concepts of patient safety, team communication and relevant concepts related to handover.

Throughout the second module, systematic communication tools were applied in different handover scenarios. Several types of verbal communication (telephone communication with other professionals, shift handover, communication with other levels of care) were analysed and performed by simulation and role-playing. Evaluations have been conducted during this process using a checklist to verify the implementation of key aspects for each case of handover. In addition scenarios were recorded for better implementation of the checklist.

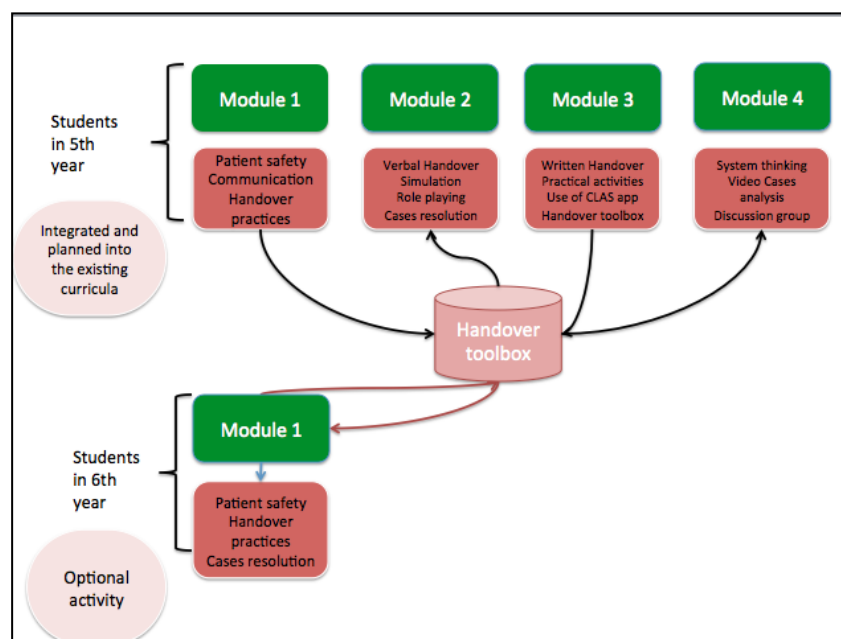


Figure 14: General structure of the training module of the pilot study in Spain.

The third module incorporated exercises in the computer lab where several cases of written handover were addressed using the Handover Toolbox. Students have had access to the hospital electronic medical records and evaluated real cases of discharge reports based on the CLAS application. Then, students practiced developing their own discharge letters and referrals based on real patients. The Handover Toolbox was used to encourage discussion about the students' opinions and main results of this evaluation.

The fourth and final module used videos to address cases of a serious adverse event related to bad handover processes. Students work in-group to identify key mistakes and root causes. Students have had the opportunity to use the Handover Toolbox and reading material, answer questions in the forum and raise issues of interest.

When the 4th module was done, a post intervention assessment was conducted. A panel discussion was organized to assess, with a qualitative methodology, the students' perspectives regarding handover training and the pilot evaluation. This session was recorded with the aim of capturing key aspect for students.

3.5 Summary on tool developments

3.5.1 The Handover Toolbox

During the work on WP4 and WP5 we observed specific requirements and needs with respect to the Handover Toolbox. We tested the Toolbox with the medical instructors of the new training module and it appeared that the original version was rather out-dated and not very user friendly for them. We therefore needed to update various parts of the Toolbox towards more modern web technologies to make it faster, easier to use and more responsive. This has been accomplished in close collaboration with the medical stakeholders. As a result core parts of the Toolbox have been redesigned and reengineered by the partner MT to make the usability more convenient. Furthermore, we integrated the

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Toolbox into the PATIENT website as this became the central information architecture for the whole project. In August 2014 the final version 2.0 has been approved by the target users and applied in the pilot studies in Ireland, Spain and Germany. Figure 15 and 16 show the previous and new design of the Handover toolbox.

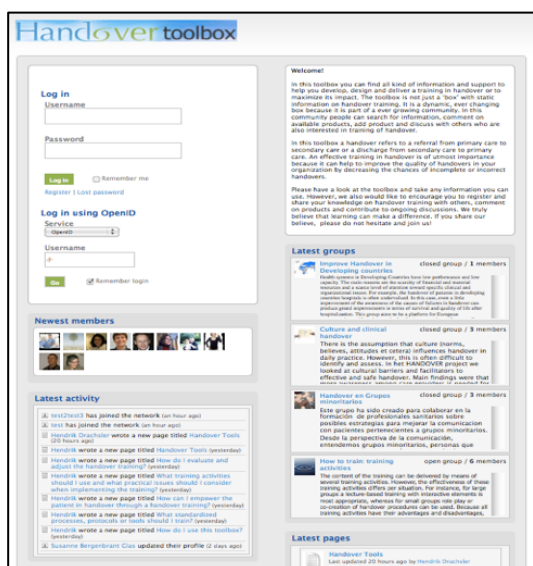


Figure 15: The original design of the Handover Toolbox as developed in 2011 in the FP7 Handover project.

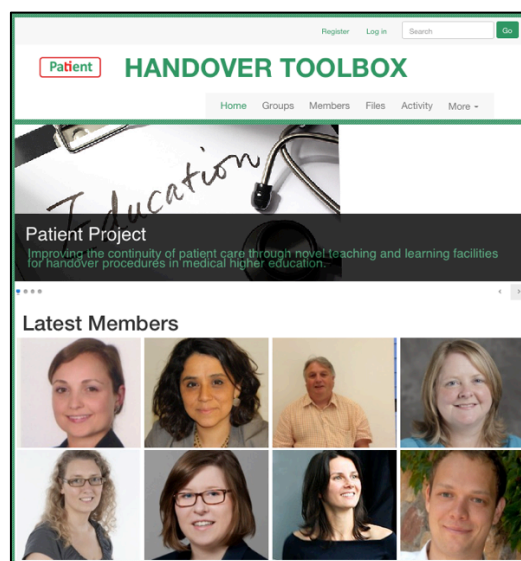


Figure 16: The new design of the Handover. It got extended with latest web technologies to improve the user experiences.

3.5.2 CLAS app - The Cork Letter Writing Assessment Scale App

The CLAS app (Maher et al., 2012) is an itemised checklist and scoring system to help medical students and junior doctors write better discharge letters. The CLAS app is the subject of an article 'Use of Mobile Applications for Hospital Discharge Letters' accepted for publication in the International Journal of Mobile and Blended learning' (Maher et al., 2013).

The CLAS team at the School of Medicine at UCC were one of the contributors to the consultative process regarding the HIQA (Health Information and Quality Authority) standard discharge letter template and many of our suggestions have been incorporated in the final template, which closely mirrors the CLAS checklist.

We are also proud that the CLAS app won the Crystal Clear MSD Health Literacy Award 2013 in the General Practice category¹¹. Each year, NALA, the National Adult Literacy Agency in Ireland, along with a judging panel from a broad spread of healthcare organizations, choose projects, which they consider make a difference to communication of healthcare information.

The CLAS app project was selected from nearly 130 entries, which had to demonstrate how they addressed the issue of health literacy. Ms Ciara O'Rourke, judge and Access, Policy & Communications Director at MSD commented that 'everyone working within the healthcare sector has a role to play in ensuring information provided to service users is accessible and clear.' Inez Bailey, Director of the National Adult Literacy Agency (NALA) commented that

¹¹ <http://www.healthliteracy.ie/2013-health-literacy-award-winners/>

‘... the initiatives that have been recognised here today show what can be accomplished when clear communication is used in healthcare.’

The judging panel for the awards is represented by individuals from NALA, MSD, the Health Service Executive (HSE), the Health Information and Quality Authority (HIQA), the Irish Practice Nurses Association (IPNA), University College Dublin, General Practice, PracticeManager.ie and University College Cork.

The CLAS app was further developed by the consortium to meet the needs of the students at the implementation sites. We therefore produced a semantically correct translation of the CLAS app from English to German, Spanish and Catalan. The translation of CLAS was more challenging than expected, as a literal translation was not possible due to the national context the app is applied in. We therefore needed to focus on a semantically correct translation, which required some changes of wording in the German and Spanish language versions. This new version was renamed to CLAS app Multiple Languages (ML). The language setting of the app is connected to the language setting of the mobile device on which it is installed. On a mobile with Spanish language settings, the CLAS app will be presented in Spanish; on a German phone it is presented in the German language. If the language on the mobile is not English, German, Spanish or Catalan, the default language for the CLAS app is set to English.

After developing and changing this update for the Apple iOS devices we also developed an Android version of the CLAS app to cater for those users with the Android operating system on their phone. By providing both operating systems (iOS and Android) we can cover almost all students and support them with the CLAS app on their personal mobile device. We thus follow a Bring-Your-Own-Device (BYOD) strategy for the handover training module rather than providing mobile devices to all students from the University. If any student has not the needed technology in place s/he can borrow a device for the duration of the course from the teaching institute. There are also printed version of the CLAS checklist available as a fall back solution.

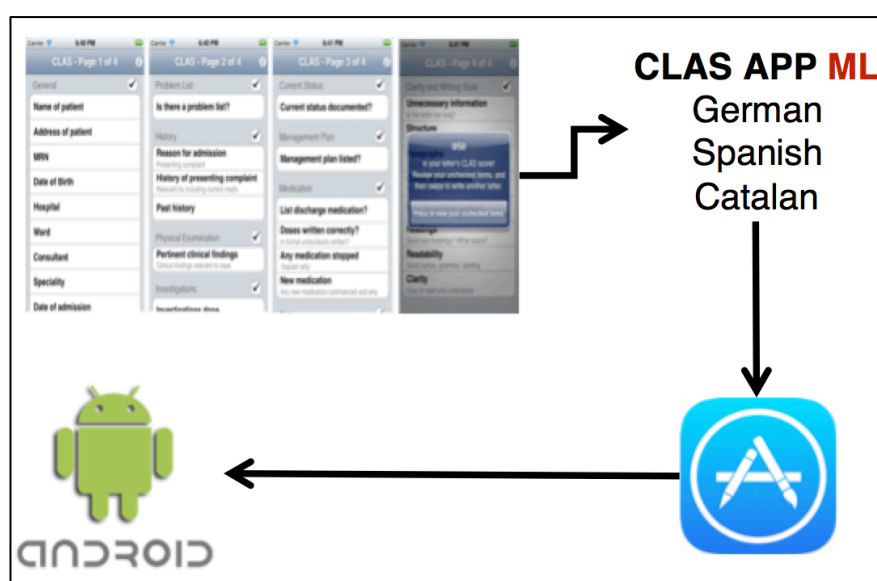


Figure 17: New developments for the prize winning CLAS app (Semantically correct translation of the checklist and deployment of the app on Android OS).

3.5.3 E-DL App - The Electronic Discharge Letter App

The e-DL mobile app provides a promising and yet secure solution to paper-based discharge letters. It is a revolutionary approach to transfer discharge letters and prevent unstructured texts, unstandardised diagnosis, language barriers, incompleteness and ambiguity. A seamless exchange between doctors, specialists and patients is technically supported by the app through the Near Field Communication (NFC) standards. NFC will dramatically change information exchange in society and will affect all kinds of living. This has become evident with the launch of the iPhone 6 that adapts NFC to the phone and directly supports paying procedures through NFC technology.

PATIENT already adopted NFC technology in January 2013 and developed the NFC standard into the e-DL app by taking over the CLAS checklist items.

In order to improve the usability of the e-DL App, as well as the feasibility of its integration in the handover workflow, 15 hospitals and healthcare organizations were surveyed. The Beta version of the app was presented at the Medicine 2.0 conference, 23.09.2013¹².

Since then the e-DL app has been further advanced and was released in July 2014 in the Android app store. In addition, the e-DL app achieves semantic interoperability, by combining the CLAS checklist for discharge letters with nine clinical terminologies and linked data sources. It encourages the adoption of a handover standard and the integration with health care systems. In addition, the e-DL app contributes to patient empowerment by offering multilingual definitions and translations of clinical concepts from terminology/ontology mappings rather than text-based searches. It automatically raises allergy alerts based on current prescriptions and previous diagnoses, all of which will ultimately improve the continuity of care, and simplify doctors' workflow and patient decisions. A demonstration video is available at: <http://youtu.be/bAT0JKPPZu4>. We are proud that the second app (like the CLAS app in 2013) developed in the context of the PATIENT project made its way through an international competition and won the first prize of the Simplificator Track¹³ at the LinkedUp Challenge¹⁴. Below (Figure 18) is a poster that describes the app as presented to the LinkedUp Evaluation Committee. An article describing the e-DL app and its evaluation is under submission at a high impact journal for medical technology for education.

¹² <http://www.medicine20congress.com>

¹³ <http://patient-project.eu/?p=1070>

¹⁴ <http://linkedup-challenge.org>

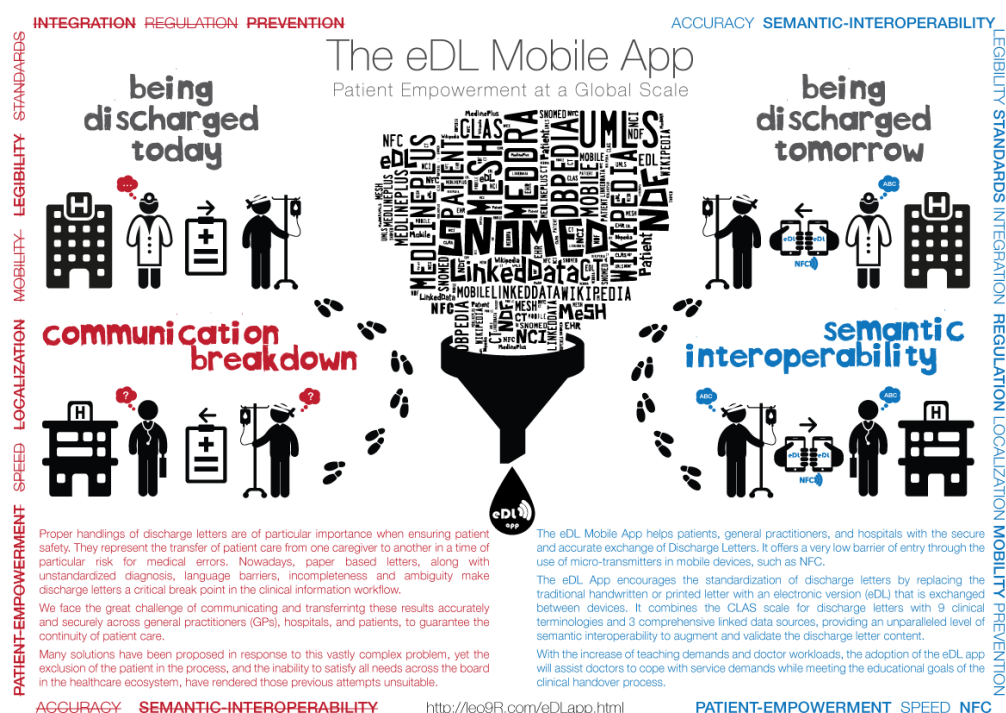


Figure 18: Poster presented at the ICWL conference in April 2014, where e-DL won the LinkedUp award.

3.5.4 SimHand App – Simulating different Handover Scenarios

Within the consortium meeting in May 2014 in Aachen, the project team came up with a concept for a new app that could support the training of handover skills beyond the local training facilities. As not every medical hospital has a simulation center for training handover skills, we thought it would be helpful to create a kind of game, where medical students (but also professionals) can practice different handovers scenarios wherever they may be.

Since the nineties, experiential learning has raised great interest amongst medical professionals. Experiential learning includes learning through and from experience (Cooper & Libby, 1997; Weidenbach et al. 2007). It is characterized by learning through doing, role-playing and simulation. Chamberlain and Hazinski (2001) in their article on Education in Resuscitation state that *'repeated practice in realistic role-playing scenarios with situations and environments students are most likely to encounter'* can increase confidence and the willingness to respond. Also, Leigh concluded that *'by participating in simulation scenarios, students can learn to control feelings of panic and their fear of emergency situations'* (Leigh, 2008). Inspired by this evidence, we had the idea to train medical handovers using an engaging game with a role-based pattern. As it is tradition within the PATIENT project, the medical partners provide suitable use cases and scenarios (partly from our WP4 Curriculum) that could be played in a game style and the technical partners came up with solutions to this game in a new app format. The app is a kind of role game for different handover scenarios. The app is available for Android on the Google Playstore in English and German language. Comparable to everyday life handover situations, SimHand involves instant decisions on what to do and the recall of important handover knowledge and checklists. This way we intend to enhance psychological preparedness of the stakeholders, thus achieving a more prompt and appropriate response in real life situations.

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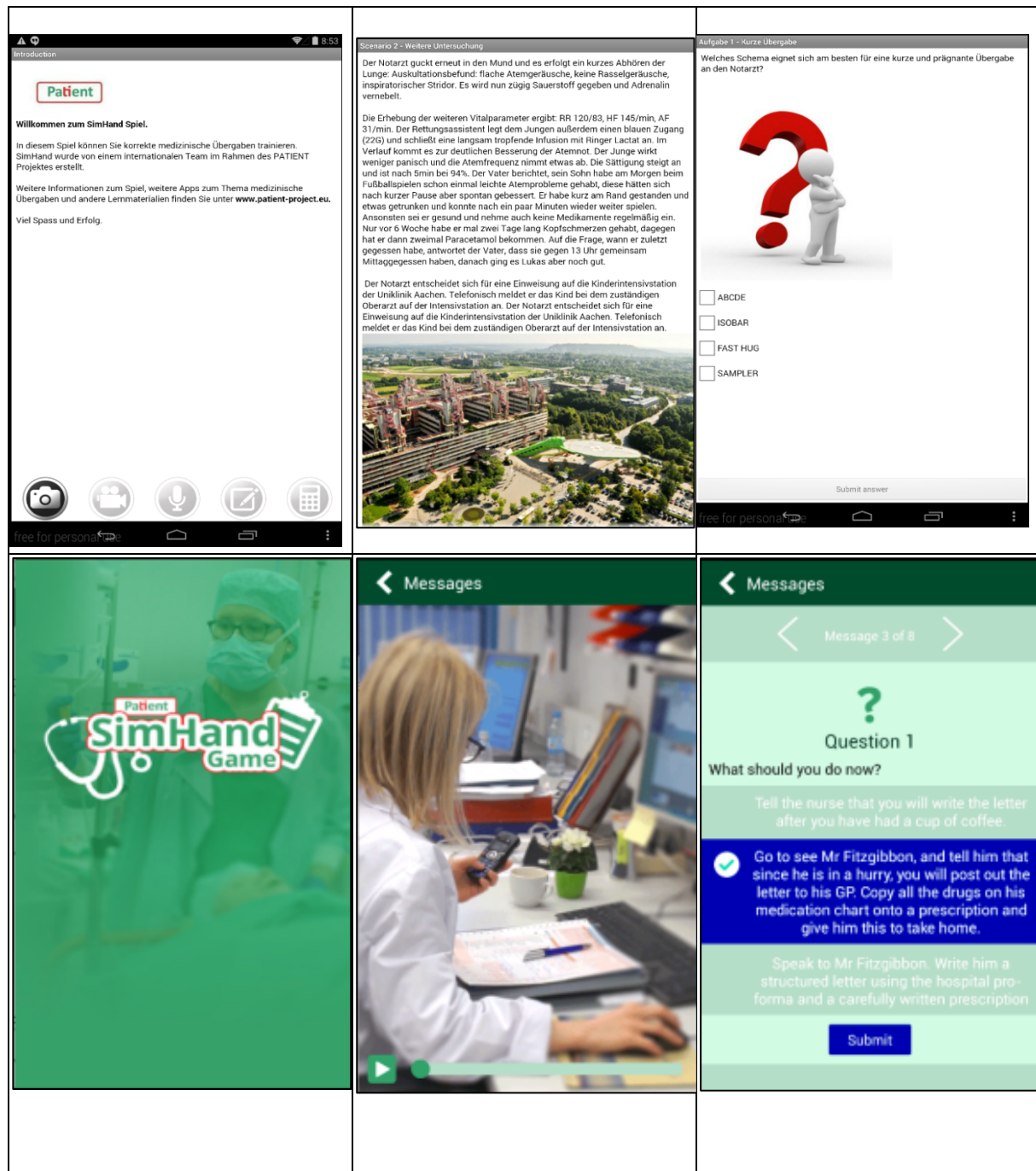


Figure 19: Development steps of the SimHand app, in the first row pictures of the 2014 version of the SimHand App, in the second row in green the final version of the SimHand app in 2015.

3.5.5 The Handover E-learning Course

Hier findest du ein Beispielvideo einer medizinischen Übergabe (engl.).



Schaue dir das Video an und bearbeite folgende Aufgaben:

Beispiel Patienten Übergabe

Question 2 of 2

8 points

Sortiere die möglichen Verbesserungsvorschläge der Reihe nach

1. Verwendung eines Übergabe Protokolls wie SBAR
2. Zusammenfassung der medizinischen Übergabe vom Empfänger
3. Bei Kontakt mit dem Patienten Fachbegriffe verständlich erklären
4. Darauf achten das alle Beteiligten Personen an der Übergabe das Übergabeprotokoll unterschreiben

Incorrect 4 / 8 Points

Finish quiz

Figure 20: Screenshot of the German version of the handover e-Learning course.

Based on the insights from WP2, WP3 and the newly created teaching materials, didactical design and assessment methods in WP4 and WP5, we feel the need to also develop a more traditional e-Learning course that can be used by other teaching institutes in Europe. Such a e-Learning course should follow well established concepts like presenting the learning content in a sequence, providing some multiple choice assessment to check the knowledge gained, and can be studied also by individuals that are not connected to a University. The course can also be used in a group setting as a digital textbook to train handover skills. In contrast to the Handover Toolbox that requires some more dynamic group interaction, the e-Learning course can be an useful to disseminate the handover contents developed within PATIENT in an easy and convenient manner to new stakeholders.

The technical partner MT developed this course within the PATIENT website. It enables other parties also involved in giving or receiving handover procedures, such as patients, GPs, or organisations

like retirement homes, to train in important handover skills. The course is based on the WP4 Curriculum and also informed by outcomes of the pilot studies. Figure 20 shows a screenshot of the course within the PATIENT website.

3.5.6 Pocket Cards



Figure 21: Picture of the Pocket Cards.

Within the PATIENT Project, we developed Pocket Cards to help students structure handover in simulation scenarios and on the wards (see Figure 21). These Pocket Cards are applicable to emergency medicine, intensive care and general ward handovers and are designed to fit into the pockets of white coats. The students have been very keen on collection all of them.

The PATIENT consortium did NOT create new handover checklists but adapted existing checklists and mnemonics to make them more accessible for students in clinical sites. The original references are cited at the bottom of

each Pocket Card. The PATIENT Pocket Cards are available in English and German. It is possible to contact the PATIENT partners via the Project's website for more information, original references and intended use of the Pocket Cards.

4. Partnerships

The PATIENT consortium is a group with extensive experience in the development and evaluation of educational programmes. Several partners have previously, or are currently collaborating on EU projects including

- HANDOVER (FAD, OUNL)
- Bioapp (OUNL, UCC)

Members of the consortium currently chair relevant international and national societies across the areas of medical business and education thus consolidating mutual information transfer, which facilitated building of this consortium. This alliance brings together university and business organisations, allowing for knowledge and skills transfer across these entities. The HEI component to the partnership is trans-disciplinary and cross-country while the enterprise partner approaches the alliance from a business perspective thus enabling true interdisciplinary knowledge exchange.

At this point, it is clear that the partnership has been working well, as evidenced by the timely delivery and dissemination of project deliverables, and the development of so many additional tools that go far beyond the outcomes mentioned in the project description (e.g. e-DL app, SimHand app, E-learning course, Pocket cards). Being part of PATIENT is experienced as a privilege rather than a duty. It has been great to work in such a constructive team of experts from different disciplines. The sustainability of this consortium is evident in that several partners have collaborated more extensively and have applied their experience subsequently to other European initiatives. The consortium together with additional partners from the PATIENT network applied for a new H2020 proposal that addresses the objectives of the PATIENT project. PATIENT especially addressed the latest call with the topic: Self-management of health and disease and patient empowerment supported by ICT. Our newly designed teaching curriculum and the medical apps are providing IT-supported tools for better health care and more patient involvement in Europe.

Within WP8, the consortium developed an exploitation and business strategy (D8.01) to continue the maintenance and further developments around the PATIENT tools. The consortium aims to establish a PATIENT foundation that will be financed through commercial training offers around the handover topic using the PATIENT tools. The aim of the foundation is to spread the knowledge about best handover practices to new stakeholder groups and support the research and further development of the PATIENT training and tools. A first course will be organised at the partner UKA in Aachen, Germany in July and September 2015.

5. Plans for the Future

PATIENT is the first project that offers a handover curriculum for undergraduate medical education in Europe, with supportive training materials, apps and e-Learning environments that have been evaluated in pilot studies and are applied in three implementation sites in Europe.

Due to the serious consequences of ineffective handovers on healthcare systems (wrong treatment, life threatening adverse events, increased health care expenditure), the exploitation potential of the PATIENT outcomes are very promising. This pressing need for handover training was emphasised again by a very recent academic paper published in August 2014 in *Medical Teacher*, stating in the conclusion that '*medical schools should incorporate handoff training as required instruction*'¹⁵.

The UKA Team in Germany has already conducted a first exploitation activity of the handover contents. They were asked to train 150 paramedic candidates as well as working paramedics in Aachen, Germany until the end of 2014. The paramedics have received three training units with essentials and background on patient safety and handover procedures with the specific context of preclinical patient care as well as a practical handover training session from the handover curriculum. The training was very well received by the paramedics and encouraged the consortium to offer its learning content and tools to more professional stakeholders on a commercial basis.

We are aware, that PATIENT holds very rich solutions to this training need in its hands. The development of an applied standard for accurate medical handovers like the CLAS app and the handover study module are attractive to a broad range of suitable stakeholders that could benefit from these outcomes. We therefore, will continue to disseminate the results to new stakeholder groups and have created an exploitation and business strategy in WP8 (D8.01) for the handover curriculum and the developed training tools.

The PATIENT consortium welcomes the exploitation strategy and the partners will continue to operate according to the work plan outlined in the WP8 report. Through the commercial training offers a PATIENT foundation will be established that offers professional training courses – *the ProHand course* – to medical professionals. The income from those courses will be used to continue dissemination of the handover topic to new stakeholder groups, and support research and the further development around the handover topic. Besides the exploitation strategy, nominated partners seek for future funding opportunities for the consortium to ensure its sustainability.

¹⁵ <http://informahealthcare.com/doi/abs/10.3109/0142159X.2014.947939>

6. Contribution to EU policies

Recent EU developments, notably the Horizon 2020 initiative and Innovation Union, indicate that smart growth in research and innovation is crucial to generating technological breakthroughs to tackle societal challenges like personalisation of health and well-being.

The Third EU Health Programme (2014-2020) is the main instrument that the Commission uses to implement the EU Health Strategy with a total budget for the programme of € 449 million Euros. The programme has 4 overarching objectives, which seek to:

1. Promote health, prevent diseases and foster supportive environments for healthy lifestyles taking into account the 'health in all policies' principle
2. Protect European Union citizens from serious cross-border health threats
3. Contribute to innovative, efficient and sustainable health systems
4. Facilitate access to better and safer healthcare for European Union citizens

PATIENT directly contributes to these four objectives as more accurate handovers affect the health and well-being of all EU citizens. The PATIENT project especially addresses the latest call with the topic: '*Self-management of health and disease and patient empowerment supported by ICT*'. In particular, our medical apps provide IT supported tools for better health care and more patient involvement. The CLAS app is an electronic checklist available in four different languages to standardise discharge letters in Europe. It can be used by medical staff to structure their letters, but also by patients to check if all relevant information is mentioned in the discharge letter. The further development of the CLAS app in the e-DL app directly supports patients in finding certified information for their diseases and supports them and their families in being more aware of the management of their health. We hope that both Apps can be further developed and implemented in one of the consortia we contributed to. Empowering citizens and patients to manage their own health can result in more cost-effective healthcare systems by enabling the management of chronic diseases outside institutions, improving health outcomes, and by encouraging healthy citizens to remain so.

When empowering patients and making handover procedures more accurate, it is increasingly unacceptable for medical students and trainees to practice skills and procedures on patients without prior simulated experience. Likewise, the United Kingdom's Department of Health's 2011 document '*A framework for technology enhanced learning*' states as a first recommendation "*As part of a managed learning process and where appropriate, healthcare professionals should learn skills in a simulation environment and using other technologies before undertaking them in supervised clinical practice*". Thus, training medical doctors will change tremendously due to new technological training facilities and tools. The PATIENT tools can be applied to train medical students and can be taken with them after the training phase into practice. For instance, students can be trained how to write and assess a discharge letter with the CLAS App, but also take the app with them to the ward and use it in moments of uncertainty. The same applies to the PATIENT Pocket Cards that were very well received by the students from the WP5 pilot studies.

Further, the PATIENT project contributes directly to the realisation of the research objectives of the H2020 program by bringing together centres of excellence, hospitals, and SMEs from

across the EU to undertake research and cooperation activities in this field. This heterogeneous combination of partners has resulted in a rich collection of outcomes that have high potentials to become commercialised and be offered to new stakeholder groups. The commercialisation strategy of the PATIENT project aims to generate enough budget to maintain the PATIENT outcomes and offer it to new stakeholder groups. It therefore contributes to the sustainability of the PATIENT outcomes for the European society.

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