INTEGRATED CARE PROGRAM FOR OLDER ADULTS:
ANALYSIS AND IMPROVEMENT

A. SÁNCHEZ¹², E. VILLALBA-MORA¹², I. PEINADO¹², L. RODRIGUEZ-MAÑAS¹²

1. Hospital Universitario de Getafe, Madrid. 2. Centro de Tecnología Biomédica, Universidad Politécnica de Madrid. Corresponding author: Elena Villalba-Mora, Universidad Politécnica de Madrid. Spain, elena.villalba@upm.es

Abstract: Objective: We aimed to in-depth analyse the Integrated Care Programme for older in- and out-patients implemented for more than 25 years at the Hospital Universitario de Getafe, in Madrid, Spain. We identify the strengths and barriers hindering the full operation, and we proposed a technological solution that overcome these constraints and facilitated integration. Design: First, we carried out a comprehensive analysis of the integrated care program at the HUG following Case Study Research; the primary unit of analysis was the Geriatrics service and its clinical units. Secondary sources of analyses were professionals’ insights (obtained thought direct observation and interviews) and statistics on the service. After the identification of the barriers preventing complete success, we designed a Health Information System and developed a mock-up that was validated with the professionals. Finally, we passed the specifications to the Information System Unit at the Hospital to develop and integrate the system into the hospital one. Setting: The Geriatrics Service of the University Hospital of Getafe, pertaining to the public Healthcare System of the Region of Madrid (Spain). Participants: No patient participated in the study. All staff from the Geriatrics Service and the ICT manager of the hospital contributed to the design of the Health Information System; and 3 geriatricians from the Service and 1 primary care physician validated it. Measurements: First, we qualitative analysed the Integrated Care Program taking as dimensions eight facilitators towards integrated care. In response, we proposed an integrated information system solution. Later, we interviewed the staff geriatricians to analyse the Integrated Care Programme. Finally, we validated our proposed system in terms of usability and user experience using the System Usability Score-SUS and the User Experience Questionnaire-UEQ, respectively. Results: The Integrated Care Program has demonstrated a high impact since its launch; however, the lack of integration in terms of information system was hindering the full deployment. We have designed an integrated information system which has been validated by physicians and nurses from the Geriatrics Service in terms of usability. We obtained a SUS score of 81 (68 is considered to be the cut-off point for usable systems). Besides, the perception of these professionals on our system was ‘Excellent’ in 5 out of the 6 items covered by UEQ (Attractiveness, Perspicuity, Dependability, Stimulation and Novelty) and ‘Good’ in terms of the 1 remaining (Efficiency), where there is still room for improvement. Conclusions: Our dedicated Health Information System is a robust solution to bridge information gaps and facilitate the complete integration of our Integrated Care Programme for older in- and outpatients.

Key words: Integrated care, geriatrics, health information systems, comprehensive geriatric assessment, usability.

Introduction

The Integrated Care Program (ICP) for older in- and out-patients implemented at the Geriatrics Service of the University Hospital of Getafe (HUG) focuses on the evaluation and management of patients, merging traditional clinical parameters with patient’s functional, social, cognitive, and affective status, by implementing both a Geriatric Comprehensive Assessment (CGA) and an integrated management fitted to the individual needs detected during the CGA. The ICP includes preventive programs in outpatient settings that target functional enhancement and a proactive approach in healthcare. The University Hospital of Getafe (HUG) is a public reference in- and out-patient setting belonging to the public healthcare system of the Region of Madrid, Servicio Madrileño de Salud (SERMAS). It was founded in 1991 and its Geriatrics Service targets the requirements of the demographic features of the south outskirts of Madrid. It provides service to a very particular segment of patients: very old persons (mean age of outpatients is 81 years old; mean age of inpatients is 87 years old), showing the usual features of older frail patients: they suffer from multiple chronic co-morbid conditions such as Chronic Obstructive Pulmonary Disease (COPD), Chronic Heart Failure (CHF), Diabetes, Cognitive Impairment (1), they take many drugs and they are at high risk of developing new disability when acutely stressed. Their status must be continuously assessed and they often undergo adverse events that trigger, among other adverse outcomes, recurrent hospitalisation (2). As a result, the Geriatrics Service experiences a remarkable pressure that may hinder the delivery of care.

The Geriatrics Service responded to this backdrop by implementing an Integrated Care Program (3) that promotes efficiency in terms of time, resources and workload on professionals. Integration is a concept related to the holistic understanding of the elements that constitute the entire system (4). It contributes to the efficiency of hierarchical organisations,
making their components complementary despite they work for the same purpose. Integrated systems fill service gaps and prevent tasks overlapping and discontinuities in care services. In this sense, the Geriatrics Service of HUG shifted usual Disease Management Processes (DMP), to new healthcare models that engage different professionals from different units and at different care levels both horizontally and vertically, facilitating care continuum. All this measurements have already received external recognition, being considered a 3-star Reference Site by the European Commission on 2013 under the initiative European Innovation Partnership on Active and Healthy Ageing (5).

The deployment of Integrated Care program enhanced the seamless delivery of care and improved patient outcomes in the Geriatrics Service. However, it increased the amount of data professionals must deal with.

The objectives of our research were 1) the comprehensive analysis of the Geriatrics Service, depicting all the processes related to the integrated care program; and 2) the validation of one dedicated information management tool (integrated Health Information System- HIS) in terms of usability and user perception.

Methods

The study presented in this paper was carried out by researchers from the Biomedical Research Foundation of the University Hospital of Getafe (FIBHUG) who had not been involved in the design of the Integrated Care Program. Research started in January and finished in June 2015.

The general approach for the analysis of the environment was a descriptive Case Study Research (6). This qualitative research approach is the most suitable for the holistic analysis of complex phenomena where researchers can directly immerse themselves in the subject (7, 8). The primary unit of analysis was the Integrated Care Program at the Geriatric Service itself. Secondary units were the professionals in the Services and the processes they carry out.

Data was gathered from three different information sources: (1) direct observation of the Disease Management Processes implemented in the Integrated Care Program; (2) semi-structured interviews with key stakeholders; and an exhaustive (3) documentation review (7).

We used a deductive analysis taking as dimensions the facilitators for integrated care identified by Villalba (9), resulting in the barriers that compromised the operation of the system and prevented a complete integration. In response, we proposed an integrated HIS solution to support and flourish it, following a scenario-based method (SDM) (10-14).

Later, we engaged professionals from the Geriatrics Service in the design of the HIS, holding informal meetings with them along the whole process. Moreover they participated in the assessment of the subsequent versions of the design, comparing them with the pre-existing information system and, iteratively, refining the model.

Besides, we created iterative prototypes to validate our HIS. We focused on usability, user interaction and perception rather than on aesthetics. Thus, in the first stages of the design process we implemented a low-fidelity prototype to validate the user interaction model and basic functionalities of the system on paper (15-18). Later we moved to a high-level prototype using Justinmind (http://www.justinmind.com), which enables the simulation of all links amongst screens and a wide range of functionalities.

Finally, we carried out both formative and summative evaluation (19). During the formative evaluation, we held informal meetings with professionals to refine the design. With the final high fidelity prototype, we performed summative evaluation through two questionnaires broadly accepted and employed in software engineering and user interaction which allow the quick and easy assessment of both items: the System Usability Scale (SUS) and the User Experience Questionnaire (UEQ) and (20-22).

Results

Comprehensive analysis of the Geriatrics Service and Integrated Care Program

The Geriatrics Service at HUG employs 10 staff Geriatricians, 15 residents, 1 occupational therapist, 3 nurses, 9 clinical assistants and 1 part-time social worker besides administrative staff that attend more than 5000 older patients every year. The Service comprises 6 units: (1) Community Care Unit; (2) Acute Care Unit; (3) Falls and Fractures Unit; (4) Outpatient Office and Day Hospital; (5) Liaison Team (that includes “on demand” attention to older patients in the Emergency Department and other medical and surgical Departments of the Hospital); (6) and Cognitive Impairment Unit.

Since its launching, the Geriatric Service implemented an
Integrated Care Program in order to guarantee the most efficient healthcare, to keep quality standards and to promote care continuum, adding several of their current components (Falls and Fracture Unit and Cognitive Impairment Unit) along the time, changing the procedures in some others (Community Care Unit and Outpatient Office and Day Hospital) and introducing some refinements in the operations in the Acute Care Unit and the Liaison Team. They have deployed a culture readiness aligned with last research findings. The Program stands on three pillars: first, they have shifted the standpoint for the evaluation of patients, including functional assessment, evaluating patients’ frailty, and performing Comprehensive Geriatric Assessment (23-26). Second, they have promoted the transition of care delivery from expensive inpatient setting to outpatient settings and to the community (27). And third, they have deployed prevention plans to avoid rehospitalisation and to early detect adverse events.

The Program ensures the continuity in care delivery and the assessment of patients in the community by creating a Community Care Unit (CCU). Geriatricians from the CCU, the Acute Care Unit (ACU) and the General Outpatient Clinic and Day Hospital agree discharge plans to guarantee seamless healthcare service of unstable patients. The two Geriatricians in the CCU carry out visits at patients’ home in coordination with the Primary care physicians or nursing homes and assess their status. They collect information on patients with a portable medical toolkit that enables the connection to the general Hospital HIS. The Geriatrician at the Outpatient Clinic follows up patients in better functional conditions to that shown by patients attended by the CCU through periodic visits in outpatient settings, refine the discharge plans and decide when patients are stabilized and the plan has been completed.

As a consequence, the average length of stay in inpatient settings has decreased by to 2.3 (9.1 vs. 6.8), reducing also the cost per patient. Finally, the number of unnecessary hospitalisations has been reduced by 400 patients per year. Considering that the average cost of hospitalisation per day is €500, this represents a cost saving of €1.5 million.

In addition, the Program has included prevention programs for patients after stabilization. They have settled a Day Hospital where an occupational therapist implements education, training and rehabilitation plans for frail older adults as designed by the geriatricians in charge of the Falls Unit and the Outpatient Unit after a careful Comprehensive Geriatric Assessment (CGA). The whole team (geriatricians, nurse and occupational therapist) collaborates in the design, refinement and monitoring of the patient. The aim is to improve or recover function, avoid rehospitalisation and adverse events such as falls or sudden functional decline. Two outpatient units (Falls and Fracture Clinic and Cognitive Impairment Unit) contribute to the prevention programs. Their specialists assess patients and evaluate their progression within the program. Besides, they hold periodic meetings with the nurse and the occupational therapist of the Day Hospital and provide her with feedback to refine the prevention programs. Figure 1 sketches the different units involved in the Program, and the relationship amongst them.

**Figure 2**

Scheme of the Integrated Care Program at the University Hospital of Getafe

The comprehensive analysis of the Service also brought to light those facilitators (8) for integration present in the Integrated Care Program. The Geriatric Service has successfully deployed most facilitators. However, we did not monitor two of these promoters: First, the Geriatrics Service did not implement one interoperable nor dedicated information system supporting the integration. New care models enlarged the amount of information and the set of relevant variables necessary for the implementation of care continuum and Comprehensive Geriatric Assessment (3). Currently this information is stored in Excel data tables, not in the HIS. Geriatricians and nurses can only reach and modify these data sets from the local computer where they are stored. Every time they aim to retrieve from or to input information to either one of the two systems they must duplicate information, which hinders efficiency, makes professionals waste time and prevents proper assessment and treatment. Besides, professionals from other Services, such as Neurology or Traumatology, who also provide service to older patients that may not even know the existence of this comprehensive information, which impedes the potential contribution to the Program compromising the required holistic standpoint.

Second, the inefficient management of information has increased workload and impacted professional engagement. Initially, most professionals in the Service wagered for the transition to the Integrated Care Program. However, the increased burden they experience impacted their commitment to the initiative, which is crucial for the success of integrated care.
**Integrated Health System to fully deploy the ICP**

To overcome the absence of these two facilitators and to improve the integration already achieved at the Service, we suggested an integrated HIS that satisfies 5 important requirements agreed by the clinical staff, the innovation engineers and the HIS responsible at the Hospital. These requirements are: (1) The system must be an extension of the existing HIS; (2) the information structure must support the processes in the Program and make it available and accessible for all professionals; (3) the system must include some functionality enabling the close tracking of patients evolution; the system must be (4) scalable and (5) interoperable to other Services and Hospitals. In addition, the integrated system is expected to be extended not only within Hospital barriers but with Primary Care and other Hospitals in the region.

The HIS contains all the relevant information and variables (see Figure 2 for tables and relationships) that professionals need. The HIS allows all authorised professionals involved in care continuum to access a comprehensive overview of patients from the regular hospital Virtual Private Network, including access for the professionals and settings outside the hospital premises who belong the organisational integrated programme. It enhances patient safety, care delivery promptness and appropriateness and reduces paperwork.

Interoperability and scalability is guaranteed by mimicking the document architecture and clinical data transfer present in all hospitals in the Region of Madrid, Clinical Document Architecture (CDA) and Health Level 7 (HL7) (28), which permits the scaling-up into the HIS of the Region of Madrid.

**Figure 3**

Relational Flowchart among the different data tables

The HIS includes an initial dashboard in which professionals may find a list of the alerts in the Geriatrics Service since their last access. These alerts include falls, changes in medication, institutionalisation, consultation request etc. Moreover, the system showed a patient personal dashboard with the relevant information on their functional, cognitive and social status and their evolution. Finally, the HIS includes a specific application to guide the professionals in the Comprehensive Geriatric Assessment (see Figure 3 for the HIS navigation map).

**Figure 4**

HIS navigation map

**Validation of the Health Information System**

The results of the validation trial demonstrated the excellent perception of users in our system. 3 geriatricians from the Service and 1 primary care physician from the Research Foundation at the Hospital completed the questionnaires, and we later analysed the results.

**Table 1**

Age and gender of the participants in the study

<table>
<thead>
<tr>
<th>Participants in the study</th>
<th>User</th>
<th>Geriatrician</th>
<th>Geriatrician</th>
<th>Geriatrician</th>
<th>Primary Care Physician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age/Gender</td>
<td>38/Male</td>
<td>32/Female</td>
<td>40/Female</td>
<td>43/Female</td>
<td></td>
</tr>
</tbody>
</table>

Our system obtained an overall SUS score of 81. Although this value does not represent a percentage or an objective value to assess usability it allows the comparison with other systems. These are considered to be usable if they score above 70 in SUS (29). Therefore, the users found our system usable (see Table 2).

**Table 2**

SUS scores of the system

<table>
<thead>
<tr>
<th>System Usability Scale</th>
<th>User</th>
<th>Geriatrician</th>
<th>Geriatrician</th>
<th>Geriatrician</th>
<th>Primary Care Physician</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>82</td>
<td>80</td>
<td>80</td>
<td>82</td>
<td>81</td>
<td></td>
</tr>
</tbody>
</table>
Table 3
UEQ means in the 6 dimensions

<table>
<thead>
<tr>
<th></th>
<th>Attractiveness (A)</th>
<th>Perspicuity (P)</th>
<th>Efficiency (Ef)</th>
<th>Dependability (D)</th>
<th>Stimulation (St)</th>
<th>Novelty (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geriatrician</td>
<td>1,33</td>
<td>2,00</td>
<td>2,00</td>
<td>2,00</td>
<td>1,00</td>
<td>0,75</td>
</tr>
<tr>
<td>Primary Care Physician</td>
<td>2,00</td>
<td>1,75</td>
<td>2,25</td>
<td>2,00</td>
<td>2,75</td>
<td>2,75</td>
</tr>
<tr>
<td>Geriatrician</td>
<td>2,17</td>
<td>2,25</td>
<td>1,00</td>
<td>2,25</td>
<td>1,75</td>
<td>2,00</td>
</tr>
<tr>
<td>Geriatrician</td>
<td>1,67</td>
<td>2,00</td>
<td>1,00</td>
<td>2,25</td>
<td>1,50</td>
<td>1,25</td>
</tr>
</tbody>
</table>

Besides, we also inquired the user experience, by using User Experience Questionnaire (UEQ). In all the 6 items in the trial we got results above the average, at least good and in most cases excellent. Therefore, our system is highly valued by professionals, who consider it a good solution for their activity and for the problems arising during their performance in the integrated care approach (see Table 2 and Figure 4).

![Figure 5](image-url)

Benchmark chart and UEQ scores for our system in the 6 dimensions

Discussion

The Geriatrics Service had already built integrated care by the modification of Disease Management Processes (e.g. transition of inpatient care to outpatient care settings) and the transition to a wiser and more comprehensive evaluation of patients, following the last findings and approaches in Geriatric healthcare management (30). Indeed, the high degree of integration achieved enabled the effective and more efficient care delivery and patient assessment, and the reduction of the expenditure. Despite the positive impact of the Integrated Care Program in economic and clinical indicators, the absence of HIS constrained the achievement of complete integration. Although objective and measurable variables showed good trends, a broader analysis of the situation demonstrated non-measurable barriers that hinder the implementation and success of the integrated care program.

Researchers and innovators must devise strategies from a holistic standpoint, and this requires a multidimensional and comprehensive understanding of the system and its needs.

We proposed a solution for this situation by the implementation of an integrated HIS devoted to new processes carried out at the Geriatrics Service. The design is built over the outcomes of an in depth case study of the Geriatrics Service, so it meets real requirements: it entails efficiency, avoids information duplicity and enhances information availability.

User centred design facilitated the identification of these requirements. In particular, SDM enabled the close collaboration between the researcher and final users that leads to more effective, efficient and safer products and definitely contributes to the acceptance and success of the final models. The results obtained in the validation stage are consistent with this idea: we obtained excellent outcomes both in user experience and usability. Furthermore, scenarios empower researchers with a better understanding of participants’ actions and requirements and are suitable for summative designing processes as they are flexible, adaptable and are quickly deployed, refined and validated (31-33). Indeed, the combination of scenarios and prototypes eased the communication between professionals and system engineers: on the one side through scenarios experts could better explain which are the basic applications and requirements of the system (34); on the other side through prototypes system engineers could also monitor misunderstandings and wrong abstractions and refine their standpoint on the design (29).

Information and communication technologies (ICT) are a key element to facilitate integration. This paper has demonstrated that an integrated HIS would be highly appreciated by professionals who perceive it as a promising solution to reduce their workload and to overcome information barriers. The integrated care model in the HUG Geriatrics Service might easily be transferred and scaled up, as it does not require large investments, organisational nor legislative changes. Any system might implement a similar initiative as long as funding sources are present and professionals are willing to adopt new ways to work. Nevertheless, further research should be carried out to analyse the scalability of the HIS beyond the walls of the University Hospital of Getafe.
Besides, the inclusion of external social care organisations in the information network should be considered. Patient’s social status is part of the Comprehensive Geriatric Assessment, providing data that are needed for designing the plan of continued care. Moreover, further research will involve the very old patients in the whole process, to create a patient centric care, which will be also assessed including their point of view in the validation processes.

Finally, we showed that ICT are promising facilitators for integrated care. Nevertheless, these information systems should be developed over the in-depth understanding of the existing needs of users. Otherwise, designers may build up inefficient management tools that might become greater barriers rather than desirable drivers.

In the very old, the functional status and the subsquential frailty determines the outcome of the patients, even more than the chronic conditions they may have (35, 36). In this sense, integrated HIS provide Geriatricians with a tool to perform Comprehensive Geriatric Assessment, improving the availability of information and allowing the close and efficient follow-up of older patients.

Acknowledgments: The authors wish to thank to all professionals from the Geriatrics Service for supporting this project, especially to those who contributed directly to the validation of the integrated health information system. This research was funded by the Institute for Prospective Technological Studies of the European Commission’s Joint Research Center within the framework of the SIMPHIS project.

Ethical standards: Our research fulfilled all the ethical requirements established by the Ethical Committee of the University Hospital of Getafe.

References

1. Salive, M. E. Multimorbidity in older adults. Epidemiologic Reviews, 2013;35(1), 75-83. Available at: https://epirev.oxfordjournals.org/content/35/1/75.full.pdf+html


http://journals.jw.com/jw-medicalcare/Abstract/2014/03001/Costs_Associated_With_Multimorbidity_Among_VA_8.aspx


