How can managers in the Hospital in the Home units help to balance Technology and Physician-Patient Knowledge?[♣]

Abstract

Background: With the passing of time, knowledge like other resources can become obsolete. Thus, people in a healthcare system need to update their knowledge in order to keep pace with the ongoing changes in their operational environment. Information technology continually provides a great amount of new knowledge which can lead to healthcare professionals becoming overloaded with knowledge. This overloading can be alleviated by a process of unlearning which enables the professional to retain just the relevant and critical knowledge required to improve the quality of service provided by them.

Objective: This paper shows some of the tools and methods that Hospital-in-the-Home Units (HHUs) have used to update the physician/patient knowledge and the technology knowledge of the HHUs' personnel.

Design: A survey study was carried out in the HHU in Spanish health system during 2010.

Setting: 55 doctors and 62 nurses belonging to 44 Hospital-in-the-Home Units.

Interventions: None

Results: Three hypotheses are presented and supported which suggest that technology and physician-patient knowledge is related to the unlearning context and the unlearning context impacts positively on the quality of health services provided.

Conclusion: The key benefits of the unlearning context for the quality of service provided in HHUs are clear: it enables them to identify and replace poor practices and also avoids the reinvention of the wheel (eg: by minimizing unnecessary work caused by the use of poor methods) and it reduces costs through better productivity and efficiency (improving services to patients).

Keywords: physician/patient knowledge, technology knowledge, unlearning context and quality of health services.

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Introduction

Spain's healthcare system is recognized as one of the best public healthcare programs in the world. It provides health services to all Spanish residents regardless of their socio-economic status or participation in the formal social security network [1]. In addition, since the system is based on the universal provision of healthcare, non-residents and tourists (and even people living in the country illegally) are also provided with treatment by the system. The Spanish health care system has undergone a significant change from health insurance to the establishment of a (decentralized) national health service in the 1980s and the introduction of rationalizing and cost-control policies in the 1990s [2]. With respect to the development of new hospital services that consider cost-control policies, the Hospital-in-the-Home Unit (HHU) is an innovation that delivers acute hospital services to patients who can be cared for in their own homes [3]. If the patient stays at home then hospital admissions decrease and, more importantly, infections are avoided [4], which in turn has a significant impact on both the quality and cost of care [5].

However, despite the opportunities the health sector offers as a result of the design and development of homecare services, hospitals have been slow to adopt Hospital-in-the-Home Units (HHUs) [6], largely because the HHUs rely on an unskilled labor force characterized by high turnover and staffing instability [7]. Consequently, we conducted a study to show some of the tools and methods that Hospital-in-the-Home Units (HHUs) have used to update the physician/patient knowledge and the technology knowledge of their members. Physician/patient knowledge is the set of skills which a practitioner acquires on-the-job whilst dealing with patients (eg: intuition, motivation or polyvalence) and technology knowledge is the set of habits and routines that a practitioner acquires by using current technologies (eg: software applications, electronic bulletin boards or video conferencing).

We also propose an unlearning context to manage an appropriate balance between physician/patient knowledge and the technology knowledge. At its heart, the unlearning context attempts to reorient organizational values, norms and/or behaviours by changing cognitive structures [9], mental models [10], dominant logics [11] and core assumptions which guide behaviour [12] to attain a competitive advantage. Thus, the contribution of that context is related to its ability to prepare the ground for addressing the tensions between the physician/patient knowledge and the technology knowledge.

In the recent organizational learning research literature, the term ‘unlearning’ has been analyzed from two different but related perspectives (ie: individual forgetting and organizational un/relearning). On one hand, it is often stated that forgetting takes place at an individual level because organizations themselves cannot forget. On the other hand, organizational un/relearning, in essence, may be operationalized as relating to changes of routines in the organization. In this study we have considered that unlearning (forgetting) takes place at the individual level and, therefore, what happens at the organizational level is a change process as a consequence of the organizational relearning subsequent to individual unlearning (individual unlearning + organizational relearning = organizational change). As indicated in [19], relearning is an adaptation process where the new knowledge structures have to replace old knowledge structures while individual unlearning is the art of forgetting. Therefore, organizational relearning (individual unlearning + organizational relearning) can be understood as reflecting a

situation where employees have the facility to abandon or forget old habits, beliefs, knowledge and knowledge structures and substitute new habits, beliefs, knowledge and knowledge structures as part of a major process which can be described as organizational change. It is with this in mind that the creation of a specialized unlearning context is proposed which may be associated with unlearning at the individual level. This context consist of organizational structures and factors that relate to the examination of perceptual lens(es), the changing of individual habits and the framework for consolidating emergent understandings. The final outcome of the creation of this specialized unlearning context will be an enhanced awareness on the part of members of the HHU (and any other group of individuals in a knowledge rich organizational environment) that much of their hard-earned knowledge, intuition, and opinions depend on assumptions about the world that are simply no longer true.

In this study, we test such relationships between both types of knowledge and both the unlearning context and the improvement of the quality of the health services. Also, we can illustrate the management elements in health units that health managers have to consider (ie: HHUs) to improve the quality of service provided. These relationships are examined through an empirical investigation of 54 doctors and 62 nurses belonging to 44 Hospital-in-the-Home Units.

Methods

Study design and unit of analysis

We conducted a survey study at the Hospital-in-the-home units (HHU) in Spain. The Hospital-in-the-Home sector is an appropriate setting for an investigation of knowledge and unlearning context and its impact on quality of health services provided. This is mainly because these units provide 'face-to-face' interaction allowing the exchange of information inserted into the social context of the patients which by its tacit character is more difficult to imitate because it is not directly available and needs more time to be assimilated. This means constantly searching for new ways to improve homecare services, developing new offerings and introducing improved working methods, but they will only occur if practitioners, carers and patients are engaged to share individual expertise. All of this results in the creation of organizational knowledge [13].

We used a list of home care units (71 HHU) provided by the National College of Practitioners (NCP) as an initial sampling frame, but it is not properly updated. However, the Spanish Homecare Society in Spain provided us an updated list of all 65 HHUs. Thus, we considered 65 units in this research, attending to the Spanish Homecare Society.Those units were contacted and asked by the Spanish Homecare Society to participate in the study and 44 agreed. Surveying took place over a period of two months, from December 2009 to January 2010. Participants were divided into two categories: HHU members with nursing backgrounds and HHU members with medical backgrounds. In total, 63 nurse managers and 63 medical managers were telephoned and invited to participate in the study and a total of 119 questionnaires were collected, of which 2 were found to be without an overall satisfaction rating. Therefore, data analysis was based on 117 valid questionnaires (55 doctors and 62 nurses). The great majority of respondents were female (62.1 percent) and had medical backgrounds (34.7 percent).

Knowledge, Unlearning and Quality of Health Services Measurement

We modelled 'unlearning context' as formative second-order constructs. We assessed the 'unlearning context' using three first-order factors or dimensions:

a) The examination of lens fitting. This refers to an interruption of the employees' habitual, comfortable state of being and it is through such a framework that individuals at an organisation will have access to new perceptions.
b) The framework for changing individual habits. This refers to the challenge of inhibiting wrong habits when an individual has not only understood the new idea but is quite motivated to make the change.
c) The framework for consolidating emergent understandings. This refers to the organisational process that can enable employees to apply their talents by implementing new mental models based on adaptation to new knowledge structures.

The other three constructs (ie: technology knowledge, physician/patient knowledge and quality of health services) were measured by reflective indicators.

This study mainly used existing scales taken from the literature. The questionnaire items are given in full in the Appendix. The questionnaire constructs comprised:

a) Technology knowledge. To examine technology knowledge, we sought to measure the dimensions that have been defined in the literature [14,15,16]. Items were measured using a 7-point Likert scale. Technology knowledge consists of 4 items.
b) Physician-patient knowledge. Physician-patient knowledge includes the transformation and exploitation of knowledge in a unique dimension [17]. Items were measured using a 7-point Likert scale from the study by Jansen et al [18]. Twelve items initially assessed the extent to which physicians were able to facilitate recognition of the opportunities and consequences of patient knowledge for existing protocols, processes, and policies [17]. The scale gauged the ability of physicians to incorporate patient knowledge into their operations. The final scale consists of 5 items.
c) Unlearning context. As described above, three-dimension form the unlearning context: 'consolidation of emergent understandings', 'the examination of lens fitting', and 'the framework for changing individual habits'. The measures relating to 'consolidating the emergent understandings' consisted of six items taken from a scale designed by De Holan and Philps[19] and adapted from Cegarra and Sanchez [20]. These items describe the way management faced up to change, actively introduced it into the company through projects, collaborated with other members of the organization, and recognised the value of new information or taking risks. To measure the 'examination of lens fitting' five items were used. These items recognise the support of policies, rules, reporting, structures and decision-making protocols that encourage the identification of problems, mistakes and new ways of doing things. Finally, we measured 'the framework for changing individual habits' using seven items. This scale focuses on employees' self-awareness or their own mistakes, ways of thinking and wrong behaviour that guide everyday attitudes.
d) Quality of health services. The scale for quality of health services consisted of eight items adopted from Block and Keller [21]. Research has shown that perceived measures of quality of services can be a reasonable substitute for objective measures of performance and have a significant correlation with them [22,23,24]. While self-

assessed scales may be criticised for their validity, subjective scales have their own merits since objective indicators cannot solicit a high level of specificity in terms of industry, time horizon, and health services conditions.

Because the use of a single survey for data collection created the potential for common-method bias, we took a number of steps to minimize bias [25]. We used the procedural remedies of protecting respondent anonymity and reducing apprehension by assuring subjects that there were no right or wrong answers, improving scale items with the input of an expert panel composed of academics and former HHUs professionals, and randomizing question order.

Statistical analysis

The model (Figure 1) was tested simultaneously using partial least squares (PLS), a structural equation modelling technique employing a principal component-based estimation approach [26]. PLS originated in the social sciences (specifically economics but first became popular in chemometrics (ie: computational chemistry). PLS is a useful method for forming prediction equations when there are a large number of explanatory variables, particularly when the random error variance is large. PLS was selected because of the characteristics of our model and sample data. Our model uses formative indicators and our data is non-normal. Other techniques of structural equation modelling (eg: the covariance-based model performed by LISREL or AMOS) cannot be applied in these circumstances due to their very demanding sample distribution and sample size restrictions. PLS is a powerful method of analysis because of the minimal demands on measurement scales, sample size and residual distributions. Although PLS can be used for theory confirmation, it can also be used to suggest where relationships might or might not exist and to suggest propositions for testing later [27]. Compared to the better-known factor-based covariance-fitting approach for latent structural modelling, the component-based PLS avoids the two serious problems of inadmissible solutions and factor indeterminacy. For hypothesis testing, we used the bootstrapping procedure recommended by Chin[27].

This study uses PLS-Graph software version 03.00 Build 1058 [27]. Using PLS involves following a two-stage approach [28]. The first step requires the assessment of the measurement model. This allows the relationships between the observable variables and theoretical concepts to be specified. This analysis is performed in relation to the attributes of individual item reliability, construct reliability, average variance extracted (AVE) and discriminant validity of the indicators of latent variables. In the second step, the structural model is evaluated. The objective of this is to test the extent to which the causal relationships specified by the proposed model are consistent with the available data. One consequence of the comparison between covariance structure analysis modelling approaches and PLS is that no proper overall goodness-of-fit measures exist for models using the latter. The structural model is evaluated by examining the R^2 values and the size of the structural path coefficients. The stability of the estimates is examined by using the t-statistics obtained from a bootstrap test with 500 resamples. Finally, we performed the Stone-Geisser test for predictive relevance to assess model fit in the PLS analysis [34].

Results

With regard to the measurement model, we began by assessing the individual item reliability (Table 1). The indicators exceed the accepted threshold of 0.707 for each factor loading [29].

Insert Table 1 about here

From an examination of the results shown in Table 2, we can state that all of the constructs are reliable. They have values for both Cronbach's alpha coefficient and for a composite reliability greater than the value of 0.7 required in the early stages of research, and the stricter value of 0.8 required for basic research [30]. The AVE should be greater than 0.5, meaning that 50% or more variance of the indicators should be accounted for [31]. All constructs of our model exceed this condition (Table 2). For discriminant validity, we have compared the square root of the AVE (ie: the diagonals in Table 2) with the correlations among constructs (ie: the non-diagonal elements in Table 2). On average, each construct relates more strongly to its own measures than to others.

Insert Table 2 about here

The evaluation of formative dimensions of the high-order construct, 'unlearning context', is different from that of the reflective dimensions. The appropriate procedure for formative dimensions is an examination of the weights [32] which is a canonical correlation analysis and provides information about how each indicator contributes to the respective construct (see Table 3). Weights do not need to exceed any particular benchmark because a census of indicators is required for a formative specification [33]. The concern with formative dimensions is potential multicolinearity with overlapping dimensions which could produce unstable estimates [32]. Results of a colinearity test show the variance inflation factor (VIF) scores of the second-order construct for all dimensions are far below the commonly accepted cut-off of 10. In addition, we confirmed the validity of the formative dimensions using the procedures suggested by [31].

Insert Table 3 about here

The structural model resulting from the PLS analysis is summarised in Figure 3 where the explained variance of endogenous variables (R^2) and the standardised path coefficients (β) are shown. As can be seen, all the hypothesized relationships are significant and, therefore, the hypotheses are supported. Since PLS makes no distributional assumptions in its parameter estimation, traditional parameter-based techniques for significance testing and modelling were used [27].

Insert Figure 1 about here

Table 4 sets out the model statistics, the path coefficients and the t values observed with the level of significance achieved from the bootstrap test.

Insert Table 4 about here

Therefore, we can state that our hypotheses are supported. When q-squared is greater than zero, the model has predictive relevance. In our model, q-squared was 0.07.

Discussion

Over the past decade, patients, clinicians, and plans have announced or implemented many different quality improvement initiatives. Ironically, a balance between technology and physician-patient knowledge is rarely mentioned in this debate as a quality improvement approach. The considerations set out above lead us to expect that, although technology knowledge potentially facilitates information sharing and joint sense making, if they are not updated appropriately then physician-patient interaction is likely to suffer causing a reduction in the quality of health services, or vice versa, the existing physician/patient knowledge impedes the utilisation of the technological infrastructure. In other words, physician/patient knowledge can be a trigger for defensive routines which blind practitioners to seeing and inhibit them from reporting and dealing with the new technological demands. Such conflicts or lack of coherence arise as a result of differences in terms of, for example, beliefs, habits and things practitioners take for granted which underpin existing knowledge and knowledge structures and those associated with the new technological demands.

In our view, the tension between technology and physician-patient knowledge is based on the premise that prior knowledge exists about a topic, idea or concept and what a unit already knows (explicitly and tacitly) and what it is trying to assimilate, interacts and cross contaminates in non-linear and unpredictable ways. For example, while learning to use a new scanner requires only new knowledge, what happens when a nurse has been using another scanner for some years and the hospital acquires a new one? The new scanner may have the feeder on the left while the nurse usually works on the right. In such situations, even though technology and physician-patient knowledge potentially facilitate information sharing and joint sense-making, if those processes are not updated appropriately then HHU services are likely to suffer, causing a reduction in the level of quality [35, 36].

This study has examined how an unlearning context can help HHUs to obtain an alignment of technology and physician-patient knowledge through an empirical study of 117 HHU members in the Spanish Homecare sector. In this regard, despite the fact that high patient satisfaction levels have been reported in the Hospital-in-the-Home programme [5], the evaluation of the causes of those levels of satisfaction has been underdeveloped. Therefore, the first contribution of this research is to question the existing models which relate to knowledge and homecare quality. In testing H3, the findings demonstrate that, in order to create new or modified patient approaches, strengthen patient relationships and thus positively improve quality of health services, an HHU must be flexible in configuring (combining) technology and physician-patient knowledge in a way that is appropriate for delivering value to the patients. Otherwise, tension between technology and physician-patient knowledge may result in incorrect insights and thus might actually reduce the quality of patient relations [8].

This research's second contribution derives from the results of the empirical test of the hypotheses. The findings demonstrate that the technology knowledge has a positive effect on the unlearning context. Thus, in order to successfully implement new technologies, as well as solving the practitioners' problems, managers need to foster an unlearning context which opens the way for new habits, patterns and ways of doing and interpreting things to take place. The findings also demonstrate that the physician-

patient knowledge has a positive effect on the unlearning context. These findings corroborate the findings of Starbuck [9] and highlight the effort required to unlearn the practices involving the technology that users are accustomed to employing in their daily work because it is often replaced with new. Therefore, our unlearning context might be extrapolated to other settings as a possible means for users to update their technology knowledge. In this regard, the second-order factor included three dimensions of the unlearning context. The results of this analysis support that three different dimensions need to be addressed by the management to get an alignment of technology and physician-patient knowledge through an unlearning context (ie: consolidation of emergent understandings, the examination of lens fitting and the framework for changing individual habits).

In our study, we further suggest that the unlearning context allows health practitioners and other members of the hospital to solve new problems or to solve old problems in new ways. We think that this is an important finding as the potential for practitioners to develop will depend substantially on their ability to maintain a competitive advantage in their contribution to the delivery of goods and services to patients. Therefore, if the practitioners are not acting in an appropriate unlearning context they may be trapped in a suboptimal stable equilibrium. This sub-optimal equilibrium is demonstrated by the fact that many overburdened practitioners are forced to curtail their activities with respect to searching for and investigating different source of information. Thus, they may not be actively listening to their patients or colleagues. Also, they may be over-investing in the development of outdated initiatives or they may be under-investing in (or underestimating) mechanisms to translate what is learnt from a knowledge creation network into an appropriate action plan. Consequently, the key benefits of the use of the unlearning context for HHU research are clear. The existence of an unlearning context enables healthcare professionals to identify and replace poor practices and also avoids the reinvention of the wheel (eg: by minimising unnecessary work caused by the use of ineffective methods), reduces costs through better productivity and efficiency (improving services to patients) and increases profitability.

In practical terms, this unlearning context creates an appropriate environment for new knowledge to be made available and for HHU members to be actively focused on the patient. Examples of this new knowledge may involve approaches such as new roles and responsibilities that are required for effective technology utilization.

Finally, we proposed the unlearning context has a positive effect on the quality of health services. That is, newly created knowledge allows companies to generate new ideas and the achievement of quality of health services. From the patient's point of view, not only does the use of the unlearning context help the practitioner dig beneath the explicit knowledge and gain more in depth insights but it can also provide a two-way benefit in that interaction between the physician-patient of the efficient practice and the recipient can enrich the knowledge of both (ie: medical and personal benefits). As [36] explained, patients perceive not only medical benefits from the use of the unlearning context but also personal benefits such as reduced anxiety and feelings of isolation or increased personal attention. For example, the transfer of personal and scientific information will facilitate patients' and carers' understanding of the content of their medical records and the options for future care. In addition, this allows them to be better informed about their status of health which in turn leads patients to believe and perceive the physician as competent. This also confirms the position adopted by [37]

when they argue that persuasive communication by physicians enhances patients' perception of efficacy. By updating technology and physician-patient knowledge, physicians will be able to convey to their patients that they know very well the disease and its manifestation. Impressed by the ability of the physician to reveal in some details the ailments they are suffering from, patients will not only perceive the physician as competent but they will also feel secure and, consequently, they will feel that they are in good hands.

This study has some limitations. We are only able to provide a snapshot of ongoing processes and not measures of the same process over time. Second, although the constructs have been defined as precisely as possible by drawing on relevant literature and validated by practitioners, they can realistically only be thought of as proxies for an underlying latent phenomenon that is itself not fully measurable. Third, the model presented in this study was general and did not capture the possible moderating effects of environmental turbulence and uncertainty. Prior research has shown that the effect of cognitive factors on individual, group and organisational performance can vary substantially with environmental conditions.

Conclusions

In conclusion, it is worth noting that the unlearning context shown above is not only a way to forget old knowledge but also the way that HHUs are able to relearn and develop new knowledge. For example, our findings indicate that it is through 'an unlearning context' that members of an HHU will identify outdated systems (eg: procedures, structural and cultural artifacts) by introducing new approaches and result in better quality of health services. One conclusion that might be drawn from this result is that an unlearning context can encourage individuals to question not only the information they own but also whether their particular approach to innovation is applicable or not. Hence, the unlearning context is a very efficient tool in order to increase the healthcare quality services. In this regard, we hope HHUs can begin to consider unlearning to handle better the balance between technology and physician-patient knowledge.

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TABLE 1: Factor Loadings of reflective constructs

Items	*Technology Knowledge*	*Physician-Patient Knowledge*	*Consolidation of emergent understandings**	*The examination of lens fitting**	*The framework for changing individual habits**	*Quality of Health Services*
Our unit has acquired new and relevant technological knowledge	**0.896**	0.557	0.485	0.372	0.369	0.442
Employees of our unit has acquired critical technical skills and abilities	**0.929**	0.523	0.452	0.398	0.376	0.389
Our unit improvements has been influenced by new incoming technological knowledge	**0.927**	0.540	0.453	0.397	0.368	0.349
Your unit has been considered as a learning organization	**0.872**	0.654	0.577	0.613	0.498	0.525
Employees record and store newly acquired knowledge for future reference	0.580	**0.742**	0.462	0.419	0.321	0.401
Our unit quickly recognises the usefulness of patient knowledge to existing knowledge	0.442	**0.817**	0.408	0.328	0.328	0.284
Patient complaints fall on deaf ears in our unit (reverse)	0.498	**0.832**	0.534	0.393	0.401	0.354
We constantly consider how to better exploit knowledge	0.444	**0.746**	0.463	0.285	0.500	0.467
Our unit has difficulty implementing new services (reverse)	0.533	**0.784**	0.461	0.331	0.356	0.424
Managers seem to be open to new ideas and new ways of doing things	0.525	0.586	**0.897**	0.484	0.572	0.435
Management has tried to initiate projects	0.434	0.513	**0.780**	0.336	0.599	0.389
Managers recognise the value of new information, assimilate it and apply it	0.520	0.525	**0.754**	0.452	0.602	0.556
Managers adopt the suggestions of personnel in the form of new routines and processes	0.418	0.452	**0.842**	0.503	0.601	0.523
Managers are prone to collaborate with members of the hospital and to solve problems together	0.386	0.427	**0.794**	0.458	0.594	0.497
Managers are concerned with the fact that the manner of answering before unforeseen circumstances will be known by all	0.345	0.398	**0.702**	0.411	0.599	0.422
Employees are able to identify problems (new ways of doing things) easily	0.419	0.415	0.345	**0.788**	0.446	0.447
Employees are able to see mistakes from my colleagues	0.417	0.373	0.382	**0.779**	0.461	0.303
Employees are able to listen to my patients (e.g. complaints, suggestions)	0.408	0.307	0.390	**0.773**	0.358	0.314
Employees are able to share information with my boss easily	0.443	0.362	0.511	**0.863**	0.457	0.378

Employees try to reflect and learn from their own mistakes	0.394	0.371	0.525	**0.886**	0.471	0.360
New situations have helped individuals identify their own mistakes	0.412	0.403	0.592	0.439	**0.880**	0.354
New situations have helped individuals recognise unwished attitudes	0.301	0.386	0.465	0.359	**0.789**	0.345
New situations have helped individuals identify improper behaviours	0.356	0.465	0.600	0.449	**0.850**	0.411
Individuals recognise forms of reasoning or arriving to solutions as inadequate	0.355	0.372	0.447	0.265	**0.693**	0.325
New situations have helped individuals change their behaviours	0.426	0.438	0.644	0.511	**0.916**	0.435
New situations have helped individuals change their attitudes	0.410	0.418	0.594	0.534	**0.925**	0.452
New situations have helped individuals change their thoughts	0.441	0.407	0.579	0.491	**0.856**	0.436
Your unit provides high quality services	0.380	0.322	0.369	0.341	0.287	**0.806**
Your unit has very efficient internal processes	0.418	0.422	0.376	0.233	0.398	**0.721**
Your unit is pretty resources efficient	0.389	0.367	0.375	0.329	0.290	**0.777**
Your unit serves very quickly to the patients	0.368	0.353	0.384	0.377	0.342	**0.710**
Your unit is very profitable	0.472	0.478	0.458	0.268	0.313	**0.731**
Your unit has a high productivity	0.348	0.405	0.393	0.367	0.345	**0.751**
Your unit's motivation and satisfaction is high	0.324	0.379	0.514	0.330	0.473	**0.815**
Your unit provides has low turnover	0.266	0.299	0.424	0.385	0.369	**0.732**

** Reflective dimensions of the formative high-order factor named as 'unlearning context'*

Factor loadings were estimated through the PLS algorithm. They are equivalent to loadings from principal component analysis (PCA). $y_i = \lambda_i \eta + \varepsilon_i, \quad i = 1,...,n$

y_i = reflective measure, η :construct, λ_i factor loading, ε_i error$_i$, n number of reflective items

TABLE 2: Descriptive Statistics and Correlation Matrix

	Mean	Standard Desviation	Cronbach's Alpha	Composite Reliability	Average Variance Extracted	Technology Knowledge	Physician-Patient Knowledge	Unlearning Context	Quality of health services
Technology Knowledge	5.01	1.50	0.93	0.95	0.82	**0.91**			
Physician-Patient Knowledge	5.36	1.25	0.83	0.89	0.62	0.64	**0.78**		
Unlearning Context	5.71	1.11	n.a.	n.a.	n.a.	0.59	0.61	**n.a.**	
Quality of health services	5.20	1.36	0.89	0.91	0.57	0.48	0.49	0.58	**0.76**

Notes: n.a. = not applicable. The bold numbers on the diagonal are the square root of the Average Variance Extracted. Off-diagonal elements are correlations among constructs.

TABLE 3: Weights of formative constructs

'Unlearning context' and their dimensions	weights	t de Student
Consolidation of emergent understandings	0.64	4.17
The examination of lens fitting	0.36	2.65
The framework for changing individual habits	0.16	2.02

Note: the weights (γ_i) are derived from the next equation: $\eta = \sum_{i=1}^{n} \gamma_i x_i + \zeta$

η : construct, n: number of formative indicators, , x_i formative measure, y ζ error

. The t-Student value is based on a bootstrapping non-parametric procedure for 500 subsamples.

TABLE 4: Model statistics

Hypothesis	Path coefficients	T values	R^2
Technology knowledge → Unlearning context	0.34^{**}	2.94	0.44
Physician-Patient Knowledge → Unlearning context	0.37^{***}	3.61	0.44
Unlearning context → Quality of Health Services	0.58^{***}	7.17	0.34

***p <.001, **p <.01, *p <.05, ns=not significant (based on a Student t (499) distribution with two tails).
t(.001,499)=3.310124157, t(.01,499)=2.585711627, t(.05,499)=1.964726835.
Equation describing the model: $\eta = \beta\eta + \tau\xi + \upsilon$ where η representing unlearning context and quality of health services (endogenous variables) and ξ representing technology knowledge and physician-patient knowledge (exogenous variables); β is the endogenous variables coefficient matrix; τ is the exogenous variables coefficient matrix.

Figure 1: Estimated casual relationships in the structural model

Faltan parámetros necesarios o son incorrectos.

*p < 0.05; **p < 0.01; ***p < 0.001 (based on $t_{(499)}$, two-tailed test)

Appendix 1. Questionnaire items

Technology Knowledge (1= high disagreement and 7= high agreement):
P8_1: Our unit has acquired new and relevant technological knowledge
P8_2: Employees of our unit has acquired critical technical skills and abilities
P8_3: Our unit improvements has been influenced by new incoming technological knowledge
P8_4: Your unit has been considered as a learning organization (Source: Sharma, 2000)
Physician-Patient Knowledge (1= high disagreement and 7= high agreement):
P10_2: Employees record and store newly acquired knowledge for future reference
P10_3: Our unit quickly recognises the usefulness of patient knowledge to existing knowledge
P10_7: Patient complaints fall on deaf ears in our unit (reverse)
P10_10: We constantly consider how to better exploit knowledge
P10_12: Our unit has difficulty implementing new services (reverse) (Source: Jansen et al., 2005)
The consolidation of emergent understandings: with respect to your organization indicate the degree of agreement or disagreement (1= high disagreement and 7= high agreement):
P5_1: Managers seem to be open to new ideas and new ways of doing things
P5_2: Management has tried to initiate projects
P5_3: Managers recognise the value of new information, assimilate it and apply it
P5_4: Managers adopt the suggestions of personnel in the form of new routines and processes
P5_5: Managers are prone to collaborate with members of the hospital and to solve problems together
P5_6: Managers are concerned with the fact that the manner of answering before unforeseen circumstances will be known by all (Source: Cegarra and Sánchez, 2008)
The examination of lens fitting: with respect to your current position indicate the degree of agreement or disagreement (1= high disagreement and 7= high agreement):
P6_1: Employees are able to identify problems (new ways of doing things) easily
P6_2: Employees are able to see mistakes from my colleagues
P6_3: Employees are able to listen to my patients (e.g. complaints, suggestions)
P6_4: Employees are able to share information with my boss easily
P6_5: Employees try to reflect and learn from their own mistakes (Source: Cegarra and Sánchez, 2008)
The framework for changing the individual habits: with respect to your personal skills indicate the degree of agreement or disagreement (1= high disagreement and 7= high agreement):
P7_1: New situations have helped individuals identify their own mistakes
P7_2: New situations have helped individuals recognise unwished attitudes
P7_3: New situations have helped individuals identify improper behaviours
P7_4: Individuals recognise forms of reasoning or arriving to solutions as inadequate
P7_5: New situations have helped individuals change their behaviours
P7_6: New situations have helped individuals change their attitudes
P7_7: New situations have helped individuals change their thoughts (Source: Cegarra and Sánchez, 2008)
Quality of health services: with respect to your unit performance indicate the degree of agreement or disagreement (1= high disagreement and 7= high agreement):
P15_1: Your unit provides high quality services
P15_2: Your unit has very efficient internal processes
P15_3: Your unit is pretty resources efficient
P15_6: Your unit serves very quickly to the patients
P15_8: Your unit is very profitable
P15_9: Your unit has a high productivity
P15_10: Your unit's motivation and satisfaction is high
P15_12: Your unit provides has low turnover (Source: adopted from Powell, 1998)