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April 2022

St. Elaine Hospital: Developing home hospitalization care

Dr. Joan Osborne arrived at her office in St. Elaine Hospital early as it was her usual. Just over two years after she had been appointed CEO of the institution, she was about to present to the management board a multiyear project to work towards a virtual hospital using latest and state-of-the-art patient monitoring technologies and analytics solutions.

Joan was well aware that the proposal she had been working on - in conversations with other health system stakeholders, inside and outside of her hospital - could not be implemented unless there was some consensus with the key stakeholders. Of course, not all of the stakeholders had the same weight, but some of them could be considered to have veto power, since the solution could never take off without their support. If the management board agreed to her proposal, as she expected, she would then start the discussions with the rest of stakeholders with some bilateral and multilateral negotiations.

The hospital technical committee (including clinicians, technicians and managers) had expressed their interests and wishes and had insisted on participating on its final agreement. During the last two months, Joan's team had discussions with various companies, which contributed ideas to her current proposal. One of them, TechPro, a large international technology provider approached by the hospital, presented what there was the state-of-the-art in the market, which could be integrated in the proposal at different levels. Nevertheless, they were interested in a medium to long-term agreement that could cover their initial investment. However, Joan was worried that making plans for digital technology in the hospital for longer than 3 or 5 years seemed an important and serious step for the institution, as such a deal implied not only a strong commitment to the partnership, but also a possible loss of flexibility when incorporating other technologies. She wondered whether it made sense to forge such a strong bond with a unique technological partner.

This pioneering project on the table was one that entailed monitoring patients from home – a shift of the current hospital services– fraught with challenges, internally and externally. The technology considered would allow nurses and doctors to monitor the vital signs of patients and to maintain a phone or video conversation with them without necessarily having to visit them at home. However, patients may receive home visits by nurses or doctors when necessary for instance to administer injectable drugs or when the monitored signals require so. In some cases, the doctor could require an ambulance to take the patient back to the hospital to be readmitted in the ward for further treatment

The hospital could hire a different group of doctors and nurses who would have exclusive dedication to home care, thus relieving the ward doctors of the follow up tasks, even though they would be available for

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Note: The case portrays an aggregation of different real situations, however, the names of people and institutions are fictional. This document was prepared by IESE Business School as the basis for the HALIGN simulation discussion rather than to illustrate either effective or ineffective handling of a managerial situation. September 2021.

Last edited: 06/04/22

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inter-consultation if required. In any case, the hospital would always keep the responsibility of the patients until their full recovery and complete discharge.

A less technologically advanced initiative, already used by other hospitals in the region, did not include online home monitoring, but involved daily home physical visits by nurses.

TechPro, in addition to supplying, installing and maintaining the required home equipment, had other divisions which employed doctors and nurses to provide teleconsultation and home care for long-term oncological, chronic and rehabilitation patients. In collaboration with other tech companies in the communication and security areas, it was also experimenting with an advanced call center to answer patients doubts over the phone to direct them to the most appropriate care, be it at home, a primary care center or the emergency department. They could also call ambulances on behalf of the patients, if required.

TechPro also offered St. Elaine to take over the home coverage, for both nurses and doctors, thus relieving the hospital personnel of having to make any home visits. Further, TechPro could also insource the management of the control center that would receive all the data from home patients and apply some AI predictive rules to suggest contacting the patients at home or triggering alarms when necessary. Obviously, there were other less technologically advanced private companies in the market that could be contracted to take care of the traditional home visits when required. However, Joan believed that the reputation of the hospital could be improved if they decided on making the technological jump.

One of the drivers of recent changes in health care had been the concept of high value health care, promoting initiatives that improved outcomes and held the line on reduced costs. It had been observed that high-value initiatives could not depend only on changes made by one of the system players, but they rather required a coordinated design and consensus among the different health ecosystem players. Joan was convinced that the proposal she was about to discuss was just the first of several high value initiatives that would have to be implemented, and that all the involved stakeholders would be able to learn from it.

St. Elaine Hospital

The St. Elaine´s Supervisory Board had appointed Joan Osborne as CEO entrusting her to build a more proactive and agile hospital. Joan had over 20 years of general management experience in both public and private healthcare sectors. She was trained as a medical doctor in Floravia's most prestigious medical university. After graduation she joined an NGO and served first as a doctor and later started developing her managerial abilities in a rural hospital in Africa.

Joan had taken various courses in public health and health administration, served as chief medical officer at a health insurance company and in different executive roles for various healthcare providers and research organizations in Europe before accepting the CEO position at St. Elaine.

St. Elaine hospital's history went back over 125 years. Some 30 years ago, it merged with several other hospitals in the region, to become the largest general hospital in the area, and on the top ten list in the country in patient volume. St. Elaine was the number one employer in the region, with some 4,500 employees and 850 medical specialists.

St. Elaine hospital directly served around half a million inhabitants within its area and was the referral hospital in a larger area of the country for activities such as stroke service (intra-arterial thrombolysis), cardiac interventions and oncology, covering roughly 1 million people for these services.

St. Elaine Hospital had 29 specialties, with 500.000 outpatients and 50.000 inpatients per year, with around 650 million euros in revenues. At its peak, the hospital had had over 950 beds, but had concentrated activities, improved its length of stay and had reduced its inpatient capacity to around 700 beds.

St. Elaine was a foundation (non-governmental entity) with an executive board and a non-executive supervisory board; the physicians employed by the hospital and a larger proportion of the medical staff had

a permanent position in the hospital and were unionized. Representatives of the union had already participated in the discussion with Joan to design the proposal.

Healthcare System

The healthcare system in Floravia was considered to be one of the best in Europe. It was primarily funded by means of taxes by employers and employees. The government defined a standard health care package and the public could opt to take supplementary insurance for additional treatments, for example, physiotherapy or dental care. Health care insurers offered a combination of provision of care in selected providers and/or reimbursement of costs incurred for care in other providers.

Most hospitals and care institutions were privately owned and, like many other Western European countries, had a long tradition of help and care provided by a local and regional voluntary organization. Although providers were independent companies and not public sector organizations, care institutions in general continued to provide services on a non-for-profit basis.

Governmental healthcare policies were stressed in facilitating autonomy and self-management as the life expectancy was rising and people with chronic illnesses was expected to grow quickly in the coming years. Some insurance companies, with the support of the government, were experimenting with home care for chronic patients, with the aim of ensuring their adherence to medication and their control. Some of them claimed that such a control on diabetes type 1 patients had resulted on the closure of parts of day-hospitals, since those patients, when properly monitored, did no longer require hospital visits.

In national agreements between the ministry, insurance companies and providers on long term sustainability of the health system, a transformation of the sector was foreseen stimulating a trend towards providing ”the right care at the right place”; this meant both concentrating of services when needed as well as “extramuralization” of services. The use of electronic health (e-health) and patient portals was also amongst the main issues the government aimed to address. A particular stress was still placed on digitalization in hospitals (“removing paper”) and providing patients with online access to their health records.

Renovating St. Elaine Hospital

When Joan joined St. Elaine, she began by reviewing the hospital organizational structure and won wide support to make a more horizontal organization, removing one management layer and drastically cutting the number of managers.

> *As she explained: “We hope to bring more flexibility and autonomous decision making to the hospital floor by having fewer but more empowered managers that can make their own policies and strategies.”*

She also identified other reforms needed at the hospital. Anticipating with her team the needs of external sources to finance such initiatives, she first dealt with the low solvency ratio of the hospital, facilitating future negotiations with the banks. Joan also initiated a 10-year plan to completely renovate the institution’s infrastructure. This plan included selling or dismantling parts of the hospitals that had been merged and shifting healthcare activities to the main sites being renovated.

While the hospital managed to secure a loan from the bank to enable a €350 million investment/cash out plan, Joan estimated the total renovation and investments in the coming five years would require €550-600 million, which forced the hospital to choose which projects to prioritize.

In addition, there was uncertainty about the future inpatient capacity and technical needs of the clinic, in Osborne´s view:

> *"When you start renovating a hospital, you should plan for 20 to 25 years."*

These two considerations eventually led St. Elaine to postpone construction work on the clinics and start by renovating the 18 operating rooms block, intensive care and medium care areas, the recovery and surgical ambulatory area. In addition, St. Elaine was planning to build a new children's clinic and an obstetrical complex, renal dialysis facility and cardiac catheterization and care facility.

The insurance companies with which St. Elaine worked were, of course, important stakeholders. In view of the challenge to predict capacity and technical infrastructure for the future, St. Elaine approached the major insurance company, InsurCo, which contributed up to 50 percent of St. Elaine's revenues. In recent years, InsurCo and St. Elaine had signed a multi-year contract and set up various working groups. One of these groups was dedicated to developing a vision for the hospital capacity and technical infrastructure, to design pilots in this field and to scientifically generate evidence and evaluate those pilots in a rigorous way. Even though InsurCo was well aware of some aspects of the proposal that Joan and her team had developed, it had not agreed to anything yet, pending to receive Joan's document.

Technology and Information Systems at St. Elaine

Since early 2000s, St. Elaine had already introduced an Electronic Medical Record (EMR) system into the hospital. With the exception of some nursing files, which were expected to be digitalized shortly, St. Elaine was almost paperless. However, the data in the system was not structured nor properly mined yet. The existing patient data collected by St. Elaine was fragmented in different applications and, when needed, it was consolidated through 'manual' processes. The hospital was looking into a project to consolidate all data to be capable to detect much earlier and -if possible- predict patients' health deterioration by using analytics software.

St. Elaine provided a personal portal for patients to check their personal medical records and facilitate contact with the hospital for consultations. St. Elaine also offered phone consultations to patients, although for doctors this represented a radical change. Some of them complained about the changes:

> *"When the patient comes to the hospital for a visit, she waits in the waiting room and when the doctor completes the visit with the previous patient, it starts the visit with the new patient, without delays. When I have to call the patient, she is not always available to take the call, and it wastes quite a lot of my time. Phone consultation was supposed to increase efficiency, but in reality it achieves the opposite."*

The Chief Medical Information Officer of St. Elaine commented:

> *"Change with IT is hard for doctors. They prefer to work the way they are used to and have to feel secure with it. 'Safety first' is what we always think."*

When Joan joined St. Elaine, she invited Carl Figo, a consultant at the time, to discuss how to prepare St. Elaine for the future. This led to the idea of integrating the Information and Communication Technologies department, that managed information systems and applications, with the Medical Technologies department, in charge of medical devices and technical equipment, such as monitoring systems for the ICU. Carl was later recruited to lead the newly combined department. He described the goal of the department as follows:

> *"… to have an integrated view of the development of those two disciplines within one department to support the hospital with technology development and drive its digital transformation."*

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Carl had been supporting Joan in the discussion with the different stakeholders in the home hospitalization project.

The Clinic of the Future

The Care and Operations Manager, Julia Karlsson, was appointed to lead the innovation department. She organized a workshop with physicians, nurses and patients on "What e-health could do for them?"

Out of the many ideas collected at this workshop, an initiative for "healthcare at home" was prioritized and this idea focused on monitoring surgery patients at home -maybe starting with orthogeriatric patients (fractures and/or arthroplasty)-, capturing vital signs and sending them to a control room. Monitoring patients at home should result in faster recovery -better clinical outcomes-, early discharging from the wards -efficient use of beds- and improved professional and patient satisfaction.

Initially, a pilot was devised to validate this initiative in the hospital by simulating a home-like environment and later with patients at home. By formulating this pilot, connecting inpatient to outpatient monitoring, the concept of "the Clinic of the Future" emerged in St. Elaine.

St. Elaine management team felt that, in accordance with the agreement with InsurCo, it was important to keep them not only informed, but also involved in their innovation activities, so that the insurer could learn and share knowledge that would lead to improved reimbursement models beneficial for both, St. Elaine and InsurCo. Therefore, a professional from InsurCo had joined the innovation committee and actively participated in the e-health workshop. From the perspective of InsurCo Finance Health Manager:

> *"InsurCo's goal is to provide better quality of care for policyholders and cut costs, so this involvement in St. Elaine's innovation also gave us the opportunity to work and learn within the hospital side-by-side with doctors and nurses and develop knowledge about the care processes and models for reimbursement together."*

Monitoring Equipment and Coordination Center

Once they had the vision of offering postoperative healthcare at home, St. Elaine started to approach suppliers to inquire about the functionalities of monitoring equipment.

TechPro, one of the three companies approached, had maintained a contract with St. Elaine's Imaging Department for a few years, offering remote processing of diagnostic images from their facilities in Spain. After months of discussions and exchanging ideas between the hospital and the three companies, the committee had agreed that the vision presented by TechPro, would be the most suitable for this project. TecPro was the only provider that could offer a wide variety of services, from the mere provision of equipment to the complete monitoring and supervision of patients at home.

TechPro proposed to go beyond providing ward and home monitoring equipment and offered a multi-dimensional solution, as described in Exhibit 1.

As TechPro´s Finance Health Manager, Will Morgan, explained:

> *"… a virtual coordination center, that is our term for a digital hospital - this is the central node in a regional digital health network … meaning you are the health director for the whole region, so you are the coach and sort of the air traffic controller for the caregivers and the patients in your service area."*

A large medtech supplier such as TechPro also ensured long-term sustainability of the whole solution. As Carl recalled:

> *"There have been many experiences in healthcare were start-ups quickly provide great solutions but they are not sustainable and disappear, leaving the hospital with a system that is no longer continued".*

On top of that, TechPro also offered a consultancy arm to support the hospital in redesigning the care processes. By assessing the method of care delivery, technologies employed and economic impact at every stage, TechPro sought to help caregivers to evaluate the impact of the intervention or change of technologies.

In discussing the proposed partnership, Will Morgan (TechPro) considered the 10-year contract essential because he expected that at least five to eight years would be required to verify whether the innovation really brings value to the hospital. TechPro needed a deeper partnership to justify the risk of making such a heavy R&D investment.

The proposed solution

With the existing process, patients in the wards were discharged when the doctor felt that they could go home without any significant supervision, probably scheduling a meeting with them after some time, or just transferring them to be under the control of their GP. The existing system allowed for a good supervision by the hospital professionals, who considered safer to keep the patients in the hospital ward, being frequently checked by the ward nurses, until it was decided that they were ready to go home. This also provided peace of mind to the patients and their families as they were under continuous surveillance. However, keeping the patient in the wards increased the probability of nosocomial infections and some other adverse effects, as well as limiting the patients' social interaction with friends and family.

The solution that Joan was about to present would require the hospital to work in closer cooperation with TechPro, that would first have to visit the patient's home, and prepare it before the patient's discharge from the hospital. The required equipment -sensors and medical unit- would be installed by TechPro. The patient would then be monitored - on a continuous or discrete way, depending on the needs- by the new system so that the hospital doctors could follow the patient evolution. A nurse would contact the patients, usually once a day, or more often if required, either by phone or visiting them - in case an injectable drug had to be administered. Occasionally, the doctor could also contact the patient, usually by phone, by video call on a computer or tablet, or using the integrated virtual care platform (if one was contracted)..

This early discharge could be just a reduction of the patients' length of stay (LOS) in the hospital, or a complete elimination, thus sending the patient home on the same day of the intervention. It was estimated that for the patients that entered this home-hospitalization, their LOS could be reduced by 50% or 25%, depending on how relaxed or conservative the eligibility criteria could be. Patients could be good candidates for home hospitalization if they had mild functional impairments, stable medical status, required minimal nursing needs and had some help available from a caregiver at home. Obviously, one criteria for selecting patients would be those with a long LOS in hospital that could be moved to home.

When the patients had fully recovered at home, the hospital would "discharge" them, thus finishing the episode of care by the hospital. The technological provider would then retrieve the equipment from the patient's home. Usually, the patient would then be under the supervision of his/her GP, even though some extra follow-up hospital visits could be required.

One of the areas where it seemed ripe to apply the new home hospitalization model would be on orthogeriatric surgery patients, an area that St. Elaine hospital had recently experienced an increase of around 10% yearly, even though it still only represented a small percentage of all the inpatients of St.

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Elaines's (3% of total surgery hospitalizations[1]). Joan's proposal only included the first level of what TechPro was able to supply (remote home patient's monitoring –optionally with the care platform– and the central control in the hospital), but, based on the initial experience, she was open to consider other offerings from TechPro, as well as extending the model to other patients.

There was a consensus in the hospital to launch the project with the orthogeriatric patients, but some services were also volunteering to join, while others seemed much more reluctant. Another area where there was evidence in the literature of the advantages of home hospitalizations was in bariatric surgery interventions. These patients represented another 1.5% of St. Elaine's hospitalizations. Even though the percentage of hospital inpatients who could eventually benefit from home care was now estimated that could reach 25% in the next years, Joan wanted to be cautious and do not increase the patient volume too fast. For the patients being considered for home hospitalization the current LOS was 16 days, even though the overall hospital LOS was only 6 days.

The hospital participated in a European project of value evaluation testing the grounds for collaboration with another private medtech company to move from a "fee-for-service-model" to a value based health care model, where payment and reimbursement would be tied up to the outcomes achieved. To get the best value-based healthcare, incentives for healthcare institutions, other stakeholders, and patients ought to be aligned, an issue that was also true for the home hospitalization proposal. One of the stakeholders group that was not considered in the past and was getting higher attention at the moment was the patient group. EU sponsored projects insisted that patients should be well represented in the project and that their point of view should be taken into consideration. Patients were organized in patient associations, mostly focused on specific chronic diseases because they had a lifetime impact. However, there were no patient associations for acute patients such as those undergoing some type of surgery. Joan had identified the Floravia Patient Federation, which could be helpful to understand the patient's perceptions on the proposed solution, and to diffuse the advantages of the home hospitalization program.

TechPro estimated that the mobile equipment necessary to launch the initiative with orthogeriatric patients would require an initial investment of 1.5 million euros. TechPro also offered to house the control center in its facilities, take care of processing the signals received from the patients' homes, and only inform the hospital when an alarm went off. As mentioned before, TechPro could also insource the home visit by doctors and nurses.

TechPro would be in charge of installing -and removing later- the required equipment in the patient's home and ensuring its maintenance, with a response time of less than one hour in case of malfunctioning.

Reimbursement

St. Elaine's proposal assumed that the hospital would continue to be reimbursed from InsurCo with the same existing parameters, based on the patient's DRG[2], independently of whether the patient spent the whole stay in the hospital or it was hospitalized at home. The same penalties for readmission within a few days of discharge would apply.

TechPro proposed to be reimbursed by patient*day, adjusted by complexity, depending on the number of modules to be connected for the patient's monitoring needs, and whether the monitoring was continuous

[1] In St. Elaine's hospital, surgery inpatients represented 40% of total inpatients.

[2] A diagnosis-related group (DRG) is a patient classification system that standardizes prospective payment to hospitals and encourages cost containment initiatives. In general, a DRG payment covers all charges associated with an inpatient stay from the time of admission to discharge. The DRG includes any services performed by the provider. Claims for the inpatient stay are submitted and processed for payment only upon discharge. DRGs categorize patients with respect to diagnosis, treatment and length of hospital stay. The assignment of a DRG generally depends on the following variables: principal diagnosis, secondary diagnosis(es), surgical procedures performed, comorbidities and complications, patient's age and sex, and discharge status.

(recording and sending the patient's measures non-stop) or discontinuous (only at specific times or when the hospital personnel was connected with the patient). Installing an integrated virtual care platform instead of the basic medical communications device would result in a higher reimbursement per day.

The hospital could decide to purchase the TechPro's hospital control center, to rent it, or to outsource all the control center services to TechPro. In other projects, St. Elaine had opted for a cost plus contractual agreement, where the hospital covered the project cost plus a fixed fee. In this type of contracts, the hospital was bearing most of the risk, and Joan tried to avoid it.

St. Elaine has had high occupancy in its wards, with a significant waiting list for elective treatments. Some of the patients who could have been served in St. Elaine had decided to move to other hospitals with shorter waiting lists. Even though the details of the reimbursement and the payments to TechPro had not been finalized, Joan was sure that the reimbursement for the extra patients that could be admitted with the liberated beds, could easily offset the extra costs of patients' home hospitalization. Further, the hospital could also reduce its direct costs (night and weekend personnel, cleaning staff, bed linens, food, etc.) and the 25% overhead directly related to bed utilization for the patients who could be discharged early.

The stakeholders

Joan was excited about the prospect of the home hospitalization proposal for St. Elaine. She believed it could open the possibilities for further changes in other parts of the hospital. However, other parties had to agree with a proposal before it could be implemented. Different stakeholders would have different views on the aspects of the proposal. The following stakeholders, in addition to the hospital itself, were considered important and their agreement necessary to implement any proposal:

- The insurance company, InsurCo, which should view the proposal as a first step to further co-design services with the hospital and be able to offer these extra services to their insured customers, and to attract further customers.
- The technological provider, TechPro, which aimed at using the agreement with St. Elaine as a demonstration project to sell similar services to other hospitals in the country.
- The professional staff group at St. Elaine, who sometimes felt overworked, but were very keen in providing a comprehensive service to the patients.
- FPF – Floravia Patient Federation, representing different patient organizations. In this case they "represented" the people receiving or registered to receive medical treatment in the hospital and family members of those people.

All the stakeholders were also very sensitive to the way the proposal was to be presented to the society in general and to InsurCo insured patients in particular.

Challenge

The home hospitalization was aimed at offering a better service to patients and carers, as they would be able to recover in the comfort of their own home, reduced the risks of adverse events from hospital stays such as falls or infections, and be provided by individualized care by the hospital medical personnel. Similarly, the advantages for the hospital included a more efficient use of hospital beds for more acute patients, reduced LOS, reduction of costs, better value, etc. The patients GP's would not be directly involved but eventually they could get an improved, coordinated interaction with a specialized hospital service, and could also be able to offer services in the patients' home. Finally, the insurance company expected to reduce

costs by focusing the care to the patient's real needs, and since patient satisfaction was supposed to improve, it expected to increase the number of insured customers.

Joan had even an extended view of the possibilities, including the monitoring of chronic multi-pathological patients whose frequent monitoring and quick reaction when needed could reduce hospital visits, but this was another story to be explored in the future. However, the possibilities to leverage on this home care were limitless.

As she prepared to discuss the agreement with her board colleagues –and to pass it to the different stakeholders-, Joan wondered how to prepare a proposal that had the proper combination of dimensions to make it attractive enough to all the stakeholders. She was not even sure how to capture all the dimensions of interest of all the involved parties, and had even bigger doubts about the importance of each of these dimensions to each one of them, or the range of values of these dimensions that could be accepted by them.

Exhibit 1

Solutions proposed by TechPro

TechPro was able to go beyond providing ward and home monitoring equipment and offered a multi-dimensional solution:

1. Remote home patient monitoring, enabling healthcare providers to track real-time patient's health data from a distance and use it in a treatment plan. It meant mostly sensors keeping track of the vital signs – temperature, blood pressure, heart rate, weight, oxygen saturation, blood glucose, … but it also allowed the possibility of EEG, ECG, cardiac monitor, spirometer, and other more sophisticated devices. After determining what specific patient health data would be necessary to monitor, the configuration of the system to capture the required physiological data would be decided. A central piece of medical monitoring equipment would integrate the data captured by the sensors and send them to the care provider control system. The devices offered by TechPro included sensors for continuous monitoring (e.g., a sensor worn permanently by the patient) as well as discrete sensors (e.g., which the patient used only when instructed).
2. An integrated virtual care platform (similar to a talking robot) that could be also installed in the patient's home would allow easy tele-consultation of the patient with the hospital care personnel, nurses and doctors, who could be having an interview with the patient while reviewing in real time the vital signs and their evolution.
3. A hospital monitoring center, which would integrate the data collected from the sensors of the many patients, incorporate these data into the patients HER, and trigger some alarms when necessary. TechPro could also insource this function and perform it with its own personnel.
4. An adaptive intelligence (machine-learning and deep learning functionality with a personal context) to allow caregivers to quickly interpret data, predicting worrisome situations before they fully developed.
5. Evolution towards a virtual coordination center to combine various levels of care. This would allow healthcare professionals to monitor patients in different locations in the hospital (emergency department, wards, ICU), and receive information of those being monitored at home (chronic or post-operative patients). The system would also take into account the list of patients waiting for elective surgery, and would be able to improve the utilization of the hospital resources by being able to perform some predictive functions.

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