Increasing efficiency in healthcare: a showcase in an orthopedic outpatient clinic

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Abstract

Purpose – Cost reduction is a current topic within healthcare. This article aims to show how Lean Six Sigma can be applied to make the orthopedic outpatient clinic within a hospital more cost-effective. The approach can, of course, also be applied to other departments.

Design/methodology/approach – We did a pareto analysis to select the project with the greatest potential. The most expensive and time-consuming activity is repeat consultations; these number around 7,500 per year and are all performed by the orthopedic surgeon. This limits the number of appointments available for new patients. Moreover, the hospital gets a fixed amount of money for each new patient. Therefore, reducing the number of repeat consultations is beneficial to both the patient and the hospital.

Findings – Based on data analysis, we found that the number of repeat consultations performed by orthopedic surgeons can be reduced by 19.5%. An additional 10.8% can be performed by phone, which will probably save the surgeons considerable time. The freed-up time can be used for new patients. Another result is that hospital visits by patients for repeat consults can be reduced by 20.3%. We believe that these efficiency improvements are also possible for other departments/processes. Finally, in the given case, the freed-up time for new patients could generate 465K euros.

Originality/value – This article shows that 20% of the care provided by the physicians (i.e. repeat consults) is omissible. While most projects focus on doing the same number of activities in a more efficient way, this paper shows that it is also possible to reduce the amount of medical care provided. We believe that it would be beneficial to take such a perspective when looking at other processes and departments within healthcare.

Keywords Lean Six Sigma, Value Based Healthcare

Paper type Research paper

Introduction

According to EXP (2019), medicine has made tremendous progress over the past 40 years as a consequence of two trends. First, there have been remarkable technological developments. Second, there has been steady growth in healthcare investment. This growth in health expenditures is increasingly stressing governmental budgets and has raised our awareness of the cost and value of healthcare.

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The OECD (2019) has determined that, during the past decades, total health spending has been growing faster than Gross Domestic Product (GDP). Demographic factors, such as population aging, have been shown to have a positive effect on the rise in health expenditures, but only to a limited extent. Other drivers, such as income level, technology, relative prices and institutional settings appear to have a much more profound effect (see e.g. Martins and De la Maisonneuve, 2006; Medeiros and Schwierz, 2013). Furthermore, health system resources are coming less from households paying out of pocket and more through pooled funds, in particular from domestic government sources. If this trend of increasing government health spending continues – as, according to Lorenzoni *et al.* (2014), has been forecasted by the OECD – then healthcare as we know it will become financially (ability to pay) and socio-politically (willingness to pay) unsustainable in the future.

For any healthcare system to be financially, socio-politically, medically and ethically sustainable toward the future, it should be grounded on the prevention of disease and evidence-based treatment of disease with a strong commitment to avoiding unnecessary care. At the macro (i.e. health systems policy) level, Holder and Ramagem (2012) argued that funding and medicolegal responsibilities should be organized accordingly. At the meso (i.e. health services) level, the organization of the healthcare delivery process should be optimized and, at a micro (i.e. clinical management) level, evidence-based care should be practiced. The medical community has traditionally had a strong focus on the clinical management of the individual patient, with less interest in the organization of the care delivery process. With increasing stress on healthcare budgets, operations and process management practices have found their way from industry into the healthcare arena to be employed in the optimization of care delivery processes.

In this article, we describe the outcome of a project aimed at increasing the efficiency of the orthopedic outpatient clinic of the Red Cross Hospital in Beverwijk, The Netherlands. Greater efficiency results in more time for orthopedic surgeons to see new patients and therefore more revenues for the hospital. Also, increasing efficiency is beneficial for the patient because fewer redundant activities (e.g. hospital visits) are required for the same quality of care.

The Lean Six Sigma methodology, described in De Mast *et al.* (2012), was used to perform the project. Lean Six Sigma prescribes the DMAIC stages to approach a project, with DMAIC an acronym for Define, Measure, Analyze, Improve and Control. Lean Six Sigma ensures that all project decisions are based on facts, making it an effective project approach.

The structure of this article is as follows. The next two sections give background information about the hospital and its orthopedic department, where the project was performed and the Lean Six Sigma project methodology, respectively. Then, in the following section, we outline the project itself. The final section describes our main conclusions and recommendations.

Orthopedic outpatient clinic of the Red Cross Hospital

The project was performed at the orthopedic outpatient clinic of the Red Cross Hospital in Beverwijk, The Netherlands. This section gives background information about the hospital and the clinic.

The Red Cross Hospital is a medium-sized hospital (1,033 FTEs, 250 beds) in the small Dutch town of Beverwijk (40,000 inhabitants), located approximately 40 km northwest of Amsterdam. The hospital offers all the medical specialties and hosts one of three major burn centers in The Netherlands. Some of its medical staff are organized in a partnership and the remainder are directly used by the hospital (paid employment). While the hospital is reporting positive numbers for 2019, it is facing some major challenges. First, it needs to

renovate its outdated buildings and infrastructure. Second, the hospital is facing increasing competition from nearby hospitals (Zaandam Medical Center, Spaarne Hospital in Haarlem and Hoofddorp, Alkmaar Medical Center) and from a growing number of independent focus clinics in the region that are offering one or a select number of medical specialties. It is fair to say that, although there are at present no immediate threats to the survival of the hospital as an independent institution, management should be strategically clever and financially judicious going forward. The orthopedic department of the Red Cross Hospital surgeons three orthopedic surgeons. It offers general orthopedic and trauma care, while joint replacement accounts for approximately 50% of the practice. The department serves one location, namely, the orthopedic outpatient clinic at the Red Cross Hospital. In recent years, the Dutch healthcare landscape has seen many independent focus clinics for orthopedic surgery entering the market. This has led to increasing competition for the orthopedic patient. The department has for quite some time now had the impression that its value creation is in decline. The orthopedic surgeons are particularly concerned about the number of new patients that they are welcoming.

Lean Six Sigma project methodology

The Lean Six Sigma methodology was used to perform the project and arrive at directions for effective improvement. Lean Six Sigma is the combination of the Lean and Six Sigma methodologies (De Mast *et al.*, 2012). Each method is briefly described below.

The basic principle of Six Sigma is to use facts and data in all project steps to arrive at the most effective improvement actions. The Six Sigma methodology was defined by the American statistician and quality expert Mikel Harry in 1986. It prescribes the DMAIC phases as a way of approaching improvement projects. Six Sigma also describes tools and techniques, predominantly statistical, to carry out the steps effectively. In addition, Six Sigma prescribes a project management organization framework including roles and responsibilities. Six Sigma can be seen as a general problem-solving approach that can benefit from the standard solutions offered by the Lean method.

Lean is a method for minimizing waste within an organization without sacrificing productivity (e.g. Slack and Brandon-Jones, 2018). It originated in the Japanese manufacturing industry. Central to the Lean philosophy is to reduce activities that do not add value to the product or service. Lean identifies 8 types of waste (無駄, muda): overproduction, transportation, motion, overprocessing, complexity, defect and rework, inventory and waiting time (c.f. De Mast *et al.*, 2012). Lean also takes into account waste created through overburden (無理, muri) and unevenness in workloads (斑, mura). The Lean methodology is a set of best practices that can be used to reduce the costs, man-hours and waiting times in processes. Lean offers a standard set of solutions but has limited techniques for analysis and diagnosis.

Lean Six Sigma has been demonstrated to be effective in healthcare (see e.g. Van den Heuvel *et al.*, 2006). Niemeijer *et al.* (2011) delivered generic definitions for Lean Six Sigma projects in healthcare and Kemper and De Mast (2013) provided measurement plans for Lean Six Sigma projects within service industries, particularly healthcare. Apart from these, multiple published case studies have demonstrated the application of Lean Six Sigma to improve healthcare processes. For example, Schoonhoven *et al.* (2013) showed the use of Lean Six Sigma to shorten a hospital's billings process and Schoonhoven *et al.* (2011) used Lean Six Sigma to streamline the path to optimal care for cardiovascular patients. Also, Niemeijer *et al.* (2013) showed the use of Lean Six Sigma for the development of a clinical pathway for patients with hip fractures.

The project

The aim of the project was to increase the efficiency of the orthopedic outpatient clinic of the Red Cross Hospital. In this section, we describe the project stages using the step-by-step DMAIC approach (Table 1) described in De Mast *et al.* (2012).

Define

In the *Define* stage of a Lean Six Sigma project, the team, goals, potential financial benefits and the process within the scope of the project need to be defined.

For the project in question, the project owner was the CEO of the hospital, the project leader was an external orthopedic surgeon and the team consisted of orthopedic surgeons and physician assistants.

The goal of the project was to increase efficiency, thereby freeing up time for new patients. The main process at the orthopedic outpatient clinic is the consultation and treatment of patients with musculoskeletal problems. The most expensive, i.e. bottleneck, resource in this process is the orthopedic surgeon. An increase in the efficiency of their activities means freeing up costly time that can be used for other healthcare activities or for additional patients. To select the correct activity for the project, we did a Pareto analysis of the activities conducted by orthopedic surgeons. The outcome of the analysis is as follows.

A considerable amount of time was spent on repeat consultations: on average, there were around 7,500 repeat consultations and 4,000 new consultations. Moreover, at the start of the project, the patient had to visit the hospital for each consult. Also at that time, the orthopedic surgeons felt that some repeat consultations may have been redundant from a medical perspective but needed to be planned for logistic reasons and some repeat consultations that were medically necessary could have been performed in a more efficient way, for example, by certified but less expensive resources or by telephone.

Now, reducing the number of repeat consultations performed by orthopedic surgeons frees up time, which can be used for new patients. This enables the hospital to increase its revenues as it receives a fixed payment for every new patient, covering the initial consult and any repeat consults. There are no additional payments.

Assuming that there are 7,500 repeat consultations per year and each repeat consultation takes 5 minutes (a conservative guess), then a 15% reduction in the number of repeat consultations frees up around 95 hours. If this time is used for consulting and treating new patients, then 280 new patients can be treated because each new patient requires around 20 minutes of the orthopedic surgeon's time (10 minutes for the first consult and 5 minutes for a repeat consult, with 2 repeat consults needed on average). These 280 new patients could result in 280 * €1,271 (average revenue for a Diagnose Behandeling Combinatie or DBC (diagnosis-related

Table 1.
DMAIC methodology

Phase	Step	Description
Define	DMAIC 0	Select project, establish objectives and conditions
Measure	DMAIC 1	Define CTQs
	DMAIC 2	Validate measurement procedures
Analyze	DMAIC 3	Diagnose current process
	DMAIC 4	Identify potential influence factors
Improve	DMAIC 5	Establish the effect of influence factors
	DMAIC 6	Design improvement actions
Control	DMAIC 7	Improve process control
	DMAIC 8	Close project

treatment), a mix of a new consult and some repeat consults) = €355K. Patients, too, benefit from having repeat consultations organized in an efficient way with fewer unnecessary hospital visits.

To get more insight into the outpatient process, a micro process diagram (Figure 1) was created by the project team.

The process starts with a referral of a patient with a new musculoskeletal problem to the outpatient clinic. A new musculoskeletal problem is defined as a musculoskeletal problem for which the patient has never sought medical attention by the outpatient clinic before (in which case a referral letter from a general practitioner is required by the Dutch Healthcare Authority (NZA)) or as a known problem that has "expired" under the Dutch financial system. During new consults, patients are seen by one of the orthopedic surgeons, who is supported by an assistant. These assistants are trained to perform simple medical tasks such as removing stitches and applying bandages. Often, conventional radiographs of the affected extremity have been made in advance of the new consult (in principle, this is the case for all shoulder, hip and knee patients) and can be discussed with the patient immediately. At other times, patients will need to have the radiographs taken directly after the consult and return afterwards, in principle during the same clinic session, to discuss the results. These patients are, thus, seen for a second time during the same clinic session.

A new consult has several possible outcomes. If there is no orthopedic pathology, the patient is referred back to the general practitioner.

If an orthopedic diagnosis is made, advice will sometimes suffice. The outpatient trajectory actually ends immediately after the new orthopedic consult although, in the Dutch reimbursement system, "financial closure" always takes place 3 months after the last consult.

More usually, a course of treatment can be implemented. Patients are often referred for treatment, which also includes in-house treatments such as surgery and pain treatment. For many cases, if the treatment eventually turns out to be successful, the outpatient trajectory actually ends here, so again immediately after the new orthopedic consult, as the patient will not return. If the treatment turns out to be unsuccessful, the patient may be seen again during a repeat orthopedic consult. If a patient is booked for surgery, the outpatient trajectory ends as well although these patients will, of course, receive post-surgery care.

Frequently, a diagnosis cannot be made during the first orthopedic consult and additional studies and/or consultations are required ("other"). Patients are seen a second time during a repeat orthopedic consult and sometimes this cycle needs to be repeated. Additional studies and/or consultations include conventional radiographs, special additional studies (e.g. lab tests, CT scan), image-guided interventions (these can be a treatment and/or a diagnostic tool), pain treatment (this can be a treatment and/or a diagnostic tool) or evaluation by or referral to another medical specialist. If the patient is only sent for evaluation to another medical specialist, he/she is seen

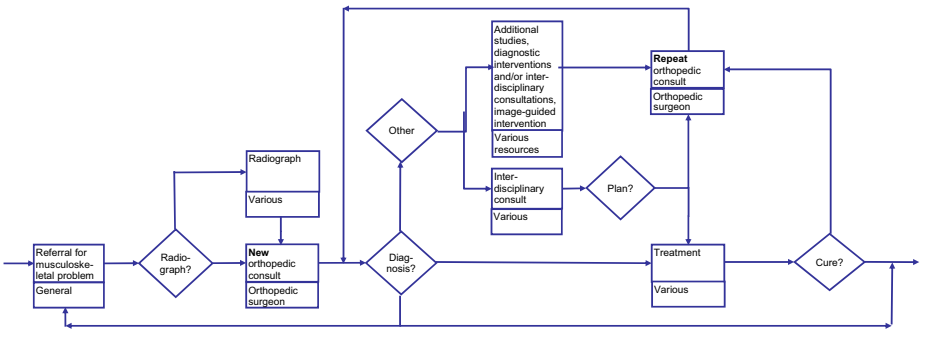

Figure 1.
Micro process map of the orthopedic outpatient clinic process

again during a repeat orthopedic consult. If the patient is referred for treatment by another medical specialist, the outpatient trajectory is actually closed unless the treatment turns out to be unsuccessful and a repeat orthopedic consultation is required.

Measure

In the measuring stage, the process metrics that should be improved by the project and their measurement procedures, i.e. operational definitions, are specified. In a Lean Six Sigma project, the process metrics that need to be improved are called Critical to Quality's (CTQs).

The number of new consultations should increase if the number of omissible repeat consultations decreases. Two relevant CTQs are, therefore, the "# New consults" and the "# Repeat consults". Apart from a reduction in the number of repeat consultations, the orthopedic surgeons also feel that some repeat consultations could be performed in a more efficient way. Specifically, there may be repeat consults that can be done by a physician assistant such as removal of stitches because such assistants are certified to do these tasks and are less expensive. Another possibility to increase efficiency is to conduct repeat consults by telephone. This probably takes less of the orthopedic surgeon's time and, moreover, is convenient for the patient because there is then no need to visit the hospital. Examples of repeat consults that could be conducted by phone are consults to discuss image results. Two of the three orthopedic surgeons already conduct some repeat consults by phone. Thus, the third and fourth CTQs of this project are "% Repeat consults performed by a physician assistant" and "% Repeat consults conducted by phone".

The CTQ flowdown is a tool to visualize the relations between the CTQs and the project goals and the relations between the project goals and the strategic goals of the organization. The CTQ flowdown of this project is depicted in Figure 2.

As is shown in the diagram, reducing the CTQ "# Repeat consults" and increasing the CTQ "% Repeat consults performed by a physician assistant" will free up the time of the orthopedic surgeon, resulting in more time for new patients. In turn, more new patients will generate additional revenues for the hospital. On the right-hand side of the CTQ flowdown, there is a pillar concerning patient satisfaction. An increase in the CTQ "% Repeat consults conducted by phone" and a decrease in the CTQ "# Repeat consults" will reduce the number of redundant hospital visits by the patient, and therefore contribute to patient satisfaction.

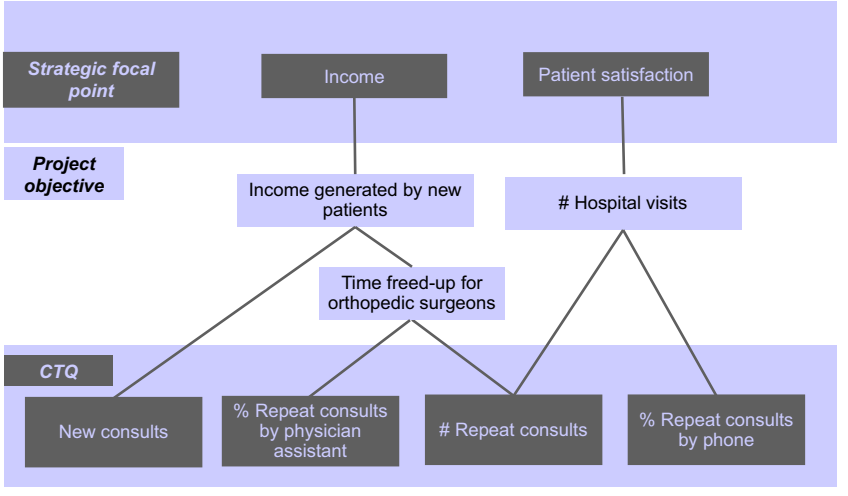

Figure 2.
CTQ flowdown of the project

Figure 3 gives an overview of the measurement procedures, i.e. operational definitions, for the four CTQs. An operational definition consists of three parts: the unit (i.e. the thing in terms of which the CTQ is measured), the measurement procedure (i.e. the data source that is used for measurement) and the requirements for the CTQ (i.e. the values desired for the CTQ). Because the project was initiated in mid-2019, data from 2018 and the first half of 2019 were retrieved from a financial information system. The data set was validated by comparing data from a random selection of patients with the Electronic Patient Record.

Analyze

In this stage of the project, the performance of the current process is analyzed. The CTQ values are presented in Table 2. It can be seen that, at the start of the project, the percentage of consults conducted by phone or performed by a physician assistant was relatively low. As far as the total number of repeat consults goes, it is not easy to say if this number is too high. Therefore, in the next part of the analysis stage, we perform further data analysis to determine the percentage of omissible repeat consults.

We also analyzed the CTQs "# New consults," "# Repeat consults" and "% Repeat consults conducted by phone" per week (note that the CTQ "% Repeat consults performed by a physician assistant" was 0 in 2018 and the first half of 2019). The results are depicted in the Figures 4–6 control charts. From the control charts, we can conclude that there were no structural changes in the CTQ values for 2018 and the first half of 2019.

The goal of the next analysis step was to determine what percentage of repeat consults performed by an orthopedic surgeon in the hospital are actually omissible, could be conducted by phone or could be performed by a physician assistant. This analysis was performed by the project leader, an external orthopedic surgeon. Together with the team, he arrived at the following guidelines for the analysis:

- A repeat consult can be conducted by a physician assistant because the latter is competent to perform the activity (e.g. the removal of a stitch or staple);

CTQ	# Repeat/New consults	% Repeat consults by physician assistant	% Repeat consults by phone
Unit	Per week	Per week	Per week
Measurement procedure	Financial system (2018 and first half 2019)	Financial system (2018 and first half 2019)	Financial system (2018 and first half 2019)
Goal	As low/high as possible	As high as possible	As high as possible

Figure 3. Operational definitions

Type of consult	First half 2018	Second half 2018	First half 2019
# New consults	1,992	1,962	2,144
# Repeat consults	4,119	3,874	3,842
Repeat consults/new consults	2.1	2.0	1.8
% Repeat consults conducted by phone	5.6	6.0	6.9
% Repeat consults performed by a physician assistant	0	0	0

Table 2. CTQ values and repeat/new consults in 2018 and the first half of 2019

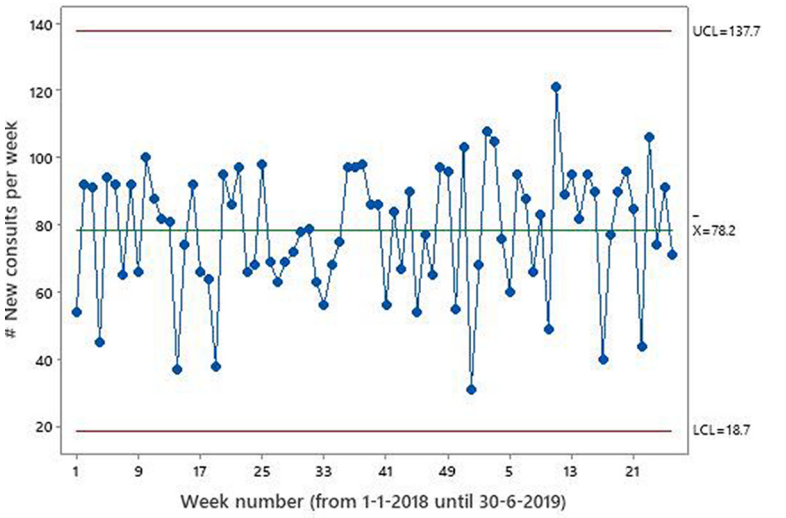

Figure 4.
Individuals control chart of CTQ "# New consults"

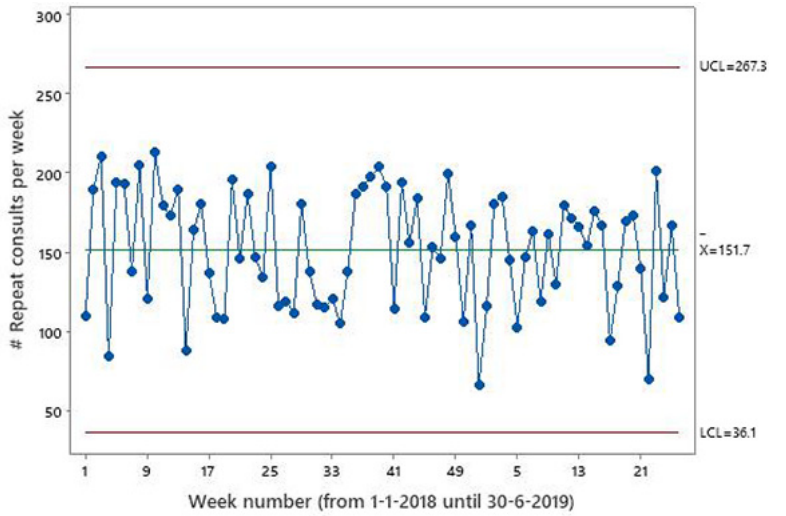

Figure 5.
Individuals control chart of CTQ "# Repeat consults"

- A repeat consult can be conducted by phone because the patient does not have to be physically present (e.g. when only an X-ray needs to be discussed); and
- A repeat consult that is redundant because it is the result of scheduling errors (e.g. a consult on the same day as the first consult) can be omitted. These consults were invariably to discuss radiographs and could be almost entirely avoided with sound preparation and planning.

The results of this analysis, based on repeat consults in February and March 2019, are presented in Table 3. We can conclude that around 10.8% of repeat consults can be

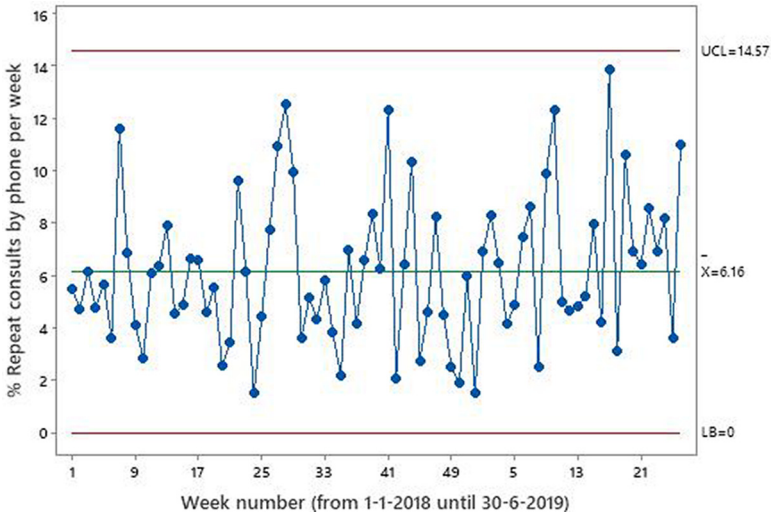

Figure 6.
Individuals control chart of CTQ "% Repeat consult conducted by phone"

Type of consult	#	(%)
Total scheduled repeat consults	1,059	100
Repeat consults that can**not** be readily omitted or replaced	738	69.7
Repeat consults that can be conducted by phone	114	10.8
Repeat consults that can be performed by physician assistants	106	10.0
Omissible repeat consults	101	9.5

Table 3.
Total and omissible physician repeat consults February–March 2019

conducted by phone; around 10% of repeat consults can be performed by a physician assistant and 9.5% of repeat consults are omissible.

We also analyzed differences across surgeons for the CTQ "% Repeat consults conducted by phone" in 2019. The results are presented in Table 4. As can be seen from the table, there is one surgeon who generally does not conduct repeat consults by phone.

Improve

In this section, we offer actions designed to improve the CTQ values.

In general, the care delivery process should be configured so as to make it maximally robust; that is, less prone to error, less sensitive to mistakes and disturbances and less sensitive to variations and

Surgeon	# Repeat consults	# Hospital visits	# Phone calls	% By phone
A	1,270	1,165	105	8.3
B	1,357	1,218	139	10.2
C	1,153	1,144	9	0.8

Table 4.
Repeat consults by an orthopedic surgeon that were conducted in the hospital or by phone in the first half of 2019

fluctuations. Care paths, based on professional guidelines, need to be written out in detail. Task assignments should be very clearly defined and standard operating procedures should be formulated to cover the entire care delivery process. This should also include standardized clinical notes. In essence, it amounts to encoding the care delivery process. Enforcing strict adherence ensures efficient care delivery and reduces variability in treatment. Standardized rosters are currently in use elsewhere but should be created for dedicated outpatient clinics. They should also be strictly adhered to; for example, new patients should be scheduled in slots previously used for repeat consults. At a later time, collaboration and alignment with other departments (e.g. radiology) will be required.

As discussed in the previous section, an important factor that influences the CTQs is the lack of clear guidelines and norms. In other words, the improvement actions boil down to standard operating procedures. We give some examples below.

Table 3 shows that 10.8% of repeat consults can be conducted by phone. A list was made of the type of consults that should be conducted by phone. These are mainly consults to discuss imaging results.

Also, 10% of consults can be conducted by a physician assistant. These include:

- Repeat consults for the removal of stitches or staples;
- Repeat consults 1 year after total hip or knee replacement; and
- Simple and predictable check-ups (e.g. after an arthroscopic partial meniscectomy, after simple hardware removal).

Furthermore, 9.5% of all repeat consults are omissible. These include:

- Repeat consults on the first postoperative day after surgery in day treatment. These are unfriendly to patients. Patients should be instructed on the day of surgery and provided with clear and complete take-home information;
- Repeat consults 6 months after total hip or knee replacement. These consults do not add medical value to the treatment;
- Repeat consults 2 years or more after total hip or knee replacement. Follow-up after 2 years does not add medical value to treatment;
- Repeat consults too soon after initiating physical conservative (most often physical therapy) treatment (e.g. 4 weeks after ACL rupture, etc); and
- Unscheduled repeat consults during the same clinic session for discussion of conventional radiographs. These consults create waste through overburden and can be completely avoided as it can almost always be determined beforehand which radiographs are needed. It is best to routinely combine a new visit to the orthopedic outpatient clinic with a visit to the radiology department.

Control

The control stage is meant to retain the implemented improvements. As discussed in the previous section, the most important improvement action is the implementation of clear guidelines. When suitable guidelines have been implemented, we recommend measuring the CTQ values and defining norms for the CTQ values, to make sure that the desired values are achieved as presented in Table 3.

Although the improvement actions had not yet been implemented upon completion of the project at the end of 2019, we did a post-measurement using data drawn from the second half of 2019. From the start of the project, new policies for repeat consultations were discussed by the

orthopedic surgeons and we believe that this then began to create some awareness about the need to reorganize repeat consultations. Figure 7 shows a control chart of the post-measurement data (1–7-2019 until 31–12-2019) and shows that indeed the CTQ "# Repeat consultations" shows a drop of 10% compared to the baseline data (1–1-2018 until 30–6-2019). The control chart shows a "signal 2" [1], meaning that the change is statistically significant. We believe that this resulted from greater awareness on the part of the orthopedic surgeons about the planning of repeat consultations. Of course, we recommend that the new guidelines be fully implemented to achieve maximum potential. The other CTQs did not show a significant difference compared to the baseline data; the results are given in Table 5.

Assuming that there are 7,500 repeat consultations per year and each repeat consultation takes 5 minutes (a conservative guess), then around 120 hours of the orthopedic surgeons' time can be freed up if the number of repeat consultations is reduced by 9.5% and 10% of repeat consults are performed by physician assistants. If this time is used for consulting and treating new patients, then 365 new patients can be treated because each new patient requires around 20 minutes of the orthopedic surgeon's time (10 minutes for the first consult and 5 minutes for a repeat consult, with 2 repeat consults needed on average). These 365 new patients will create additional revenues of 365 * €1,271 (average revenue for the DBC) = €465 K.

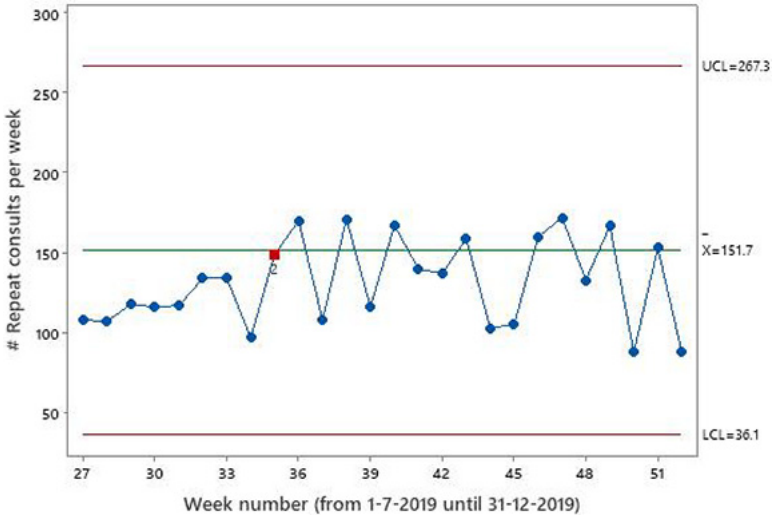

Figure 7. Individuals control chart of CTQ "# Repeat consults" in the second half of 2019

Type of consult	Second half 2019
# New consults	2,057
# Repeat consults	3,417
Repeat consults/new consults	1.7
% Repeat consults conducted by phone	7.4
% Repeat consults performed by a physician assistant	0

Table 5. CTQ values and repeat/new consults in the second half of 2019

Another important benefit is that the number of hospital visits by the patient for repeat consults falls by 20.3% (because 10.8% of repeat consults can be conducted by phone and 9.5% of repeat consults are omissible), thus contributing to patient satisfaction.

Concluding remarks

This article has described a method designed to increase the efficiency of healthcare (i.e. doing more in the same amount of time or doing the same in less time). We completed a project to increase the efficiency of the orthopedic outpatient clinic of the Red Cross Hospital and used Lean Six Sigma, a data-driven project approach, to perform the project.

First, we did a Pareto analysis of the most important resources and activities. Orthopedic surgeons are the bottleneck in the outpatient process and they spend a considerable amount of time on repeat consultations: in the outpatient clinic in question, there are around 7,500 repeat consultations per year for three orthopedic surgeons. We tried to reduce the time taken for these consultations as well as the number of consultations themselves. We did so by comparing working procedures followed by different orthopedic surgeons and different hospitals. Based on various discussions, experts in the field derived new guidelines. The data analyses demonstrate that the number of repeat consultations performed by orthopedic physicians can be reduced by 19.5% while an additional 10.8% can be performed by phone, another way in which the surgeons will probably save time. The freed-up time can be used for new patients. Moreover, hospital visits by patients for repeat consults can be reduced by 20.3%, which is of course beneficial to those patients.

With this project, we have demonstrated that it is not only possible to perform the care steps in a more efficient way but also to reduce the amount of unnecessary care delivered by physicians. We believe that it would be beneficial for both care organizations and patients to look at processes from this perspective as well: does the care really add medical value for the patient. In the present case, it was possible because the project was led by an external orthopedic surgeon.

Note

1. "Signal 2" means that 9 points in a row are on the same side of the center line. Note that we used the same control limits as for the baseline data, to compare the new data with the baseline data.

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