



Using Quality Improvement Methods to Implement Guidelines to Decrease the Proportion of Urinary Retention in Orthopaedic Care

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Abstract

In patients treated with indwelling urethral catheter (IUC), complications such as catheter associated urinary tract infections are common, while underuse of IUC may cause harmful urinary retention (UR). A quality improvement (QI) program called 'Indwelling urethral catheter (IUC) - only when needed' was developed in Jönköping County Council, Sweden, aiming at creating a new approach: hospital staff should be able to identify and manage patients with risk of UR, prevent UR or treat UR without delay, and only use urinary IUCs on appropriate indications. The aim of this study was to describe the process of application of the quality improvement program. The Model for Improvement was used, and process coaches were appointed in the participating units. Their training was based on clinical issues and facts about UR, IUCs, guidelines, QI methods and measurements. Data were collected through prospective and retrospective patient record reviews, and differences were analyzed by inferential statistics.

Before the intervention, only two patients out of 296 were cared for following the guidelines perfectly. During the intervention, adherence to guidelines showed a rising trend, and reached a new stable level, with an average of 67% adherence to guidelines. A systematic improvement program supported by coaches and improvement tools can increase the adherence to new guidelines and incorporate them

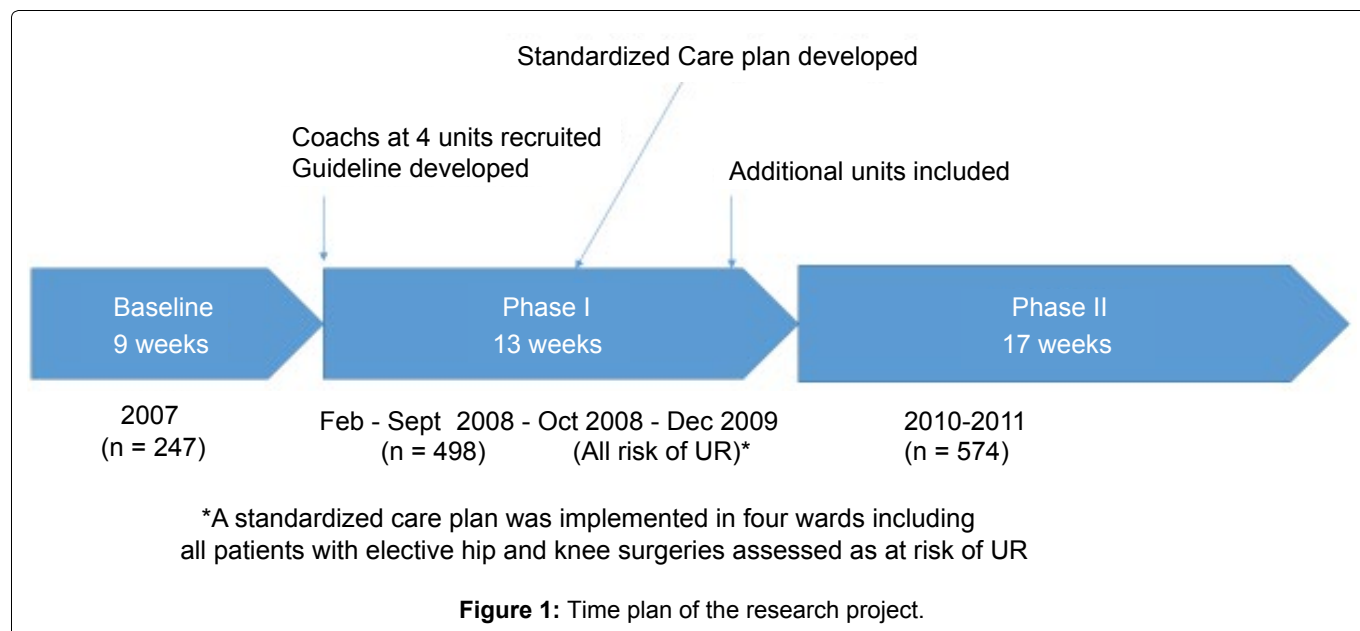
into local practice. This study also shows that adherence to guidelines can improve patient safety, in this case a decreased risk for and incidence of UR in an orthopaedic patient population.

Keywords

Guidelines, Indwelling urinary catheters, Model for improvement, Orthopaedic care, Quality improvement, Urinary retention

Introduction

Urinary retention (UR) is a well-known complication which can result in bladder damage and need for indwelling urethral catheter (IUC) treatment [1]. The incidence of UR varies widely between different diagnoses in orthopedic hospital care [2]. Patients treated with IUC experience an increased risk of complications such as catheter associated urinary tract infections (CAUTI), [3] iatrogenic urethral injuries, [4] and discomfort [5]. Urinary tract infections are the most common health care acquired infections and nearly 80% of these are catheter associated [6]. Over use and misuse of IUC during hospital care is commonly reported, [7] and delayed detec-



tion of UR in orthopaedic care is common [8]. Bladder damage caused by UR and/or CAUTI and/or iatrogenic urethral injuries increase the risk of morbidity and mortality, [4,9-13] prolongs hospital stays with increased costs [14-16] and decreases quality of life [17].

Preventive Urinary Retention

If patients at risk of UR are identified and examined with bladder ultrasonography and achieve an optimal voiding situation, UR can be prevented or existing UR can be treated without delay [18]. The most efficient method to prevent CAUTI is to avoid unnecessary catheterizations and to remove catheters as soon as possible [19]. Bundles of interventions focusing on strategies such as UR protocols and IUC stop reminders to reduce UR and unnecessary catheter use have been successful, particularly when coupled with implementation strategies to address common barriers [20].

The Quality Improvement Program

At the beginning of this study no general guidelines for minimizing UR and IUC existed for patients during hospital care. A quality improvement (QI) program called 'Indwelling urethral catheter (IUC) - only when needed' was developed in cooperation between researchers, an expert group [18] in the Region Jönköping County (RJC). The aim of the QI program was to implement a new and different work approach, which meant that hospital staff should identify and manage patients with risk of UR, prevent UR or treat UR without delay, and use urinary catheters with appropriate indications by using guidelines. The QI program was introduced between 2008 and 2012 and included all adult patients admitted to hospital care in the RJC. The guidelines consisted of five sections specifying risk factors of urinary retention, described in Johansson, et al. [18]. The aim of this study was to describe the process of implementing the program, to evaluate if a systematic quality improvement program increased the adherence to guidelines, and to examine the effects of implementing the program on the presence of UR.

Methods

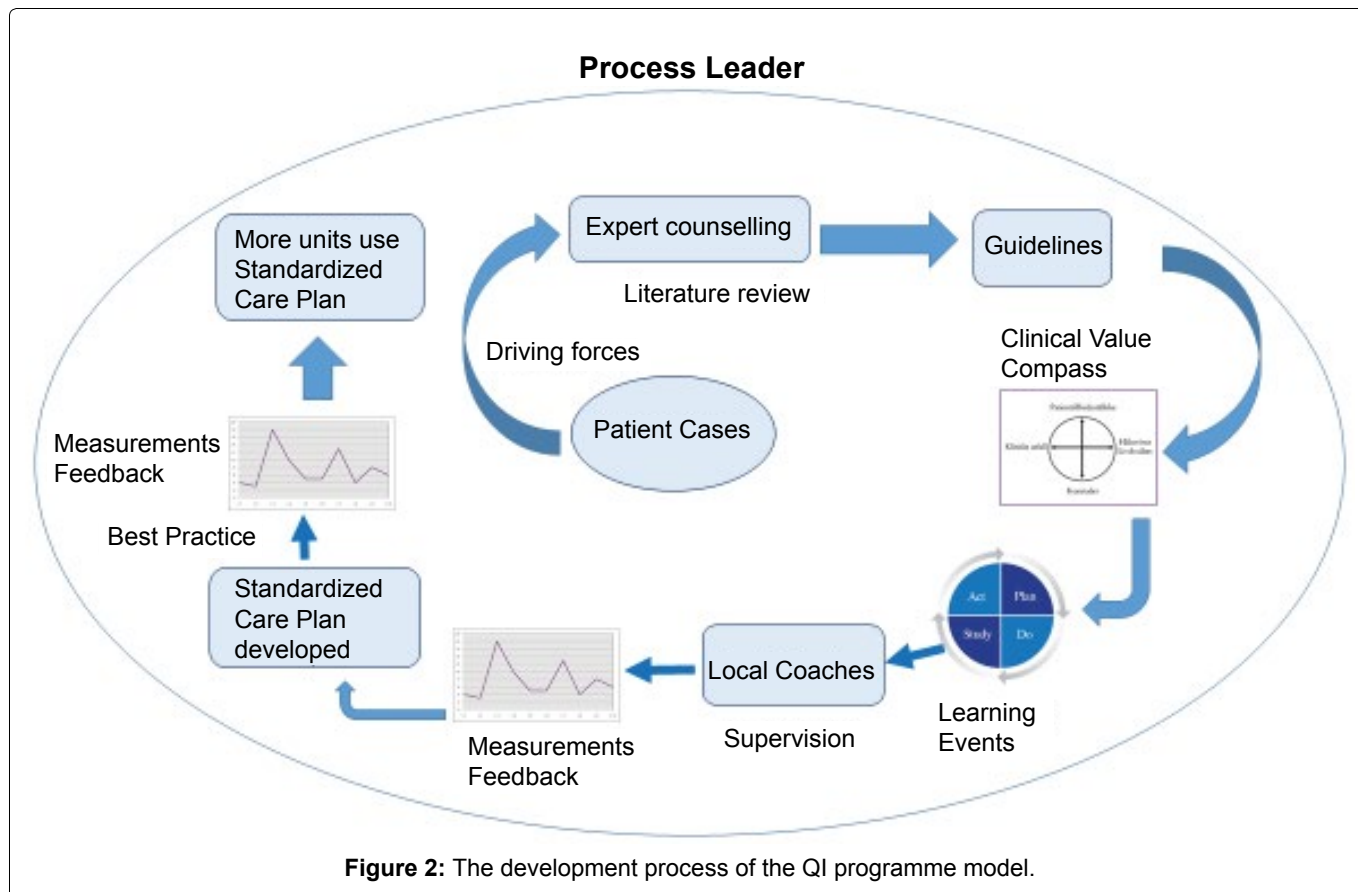
Study setting

This study was conducted to develop the process of UIC in orthopaedic care and involved patients and professionals at the emergency unit, the operating theatre, the postoperative care unit and an orthopaedic ward, in one hospital in the RJC in Sweden. The orthopaedic clinic provides both acute and elective services. Bladder damage caused by UR and both overuse and misuse of IUC had been identified as severe quality issues. In a former study we described the routines given to patients with hip fractures and it was found that nurses seldom adhere to recommended actions and UR was found in 18 of 48 (38%) patients [21].

The quality improvement program

The QI program was performed in three phases: baseline, Phase I and Phase II (Figure 1). Baseline measures were performed during a nine-week period before the QI program started. Phase I was on going for a 13-week period and Phase II over a 17-week period.

As a theoretical framework for the QI program, the Model for Improvement was used [22]. This model provided a 'trial-and-learning approach' and a frame for which knowledge and program components were needed. The developed QI program consisted of eight components and started off in real patient cases/stories serving as a driving force to start improvement [23,24]. A process leader guided the QI program. For staff to know what to do, when and by whom, guidelines for preventing and handling UR and urinary catheter treatment were developed by an expert group, based on a literature review and expert consensus published locally and in scientific journals [18]. The participating units used the Value Compass [25] and learning events using the plan-do-study-act (PDSA) cycles were conducted. Local coaches guided and supervised the staff at the units, [26] and measure-



ments and feedback were provided. The QI programme developed a standardized care plan. The consequent use of the care plan together with the guidelines was considered goal fulfilment when measuring (Figure 2). A long version of the guidelines was published on the hospital's intranet and a short pocket version was prepared, for easy use in clinical work.

Two coaches, one registered nurse and one assistant nurse, were elected in each of the four involved units and they had time allocated to contribute to the QI program. The coaches' learning was provided in groups and consisted of three learning events over a six-month period. To increase the prerequisites to identify barriers and local problems arising at each unit the coaches learned and constructed a cause and effect ("fishbone") diagram [22]. The training was based on patient cases and local issues and included facts about UR, urinary catheters, the guidelines, PDSA and measurements. To support coaches' continuous learning, learning events were offered to all coaches for two hours, every six months. The learning events included collaboration between coaches and training in process and result analysis. Physicians, registered nurses and assistant nurses were offered learning events performed by the coaches and the process leader. At regular meetings in the units the new guidelines, working procedures and results were discussed with the unit staff.

When the programme was implemented the staff registered the number of performed bladder ultrasonography procedures and the number of residual urine measures. In

order to evaluate guideline adherence the coaches reviewed a sample of ten patient records every month, selected by systematic consecutive sampling [27]. The records for the first ten patients that met the eligibility criteria were reviewed. This data were presented as run charts on each unit's whiteboard and was published on the hospital intranet. The staff had fulfilled the goals when 80% of the subsequent measurements were in accordance with the guidelines. In order to make the run charts more understandable and to visualise when the goals were fulfilled, a system with 6 'stars' (one star for each subsequent measurement) was introduced. Regularly, the staff received feedback on guideline adherence from the coaches and every other month by the process leader. In order to sustain guideline adherence and continued improvement, the coaches reviewed ten patient records six months after the units had fulfilled the goals, selected by the same systematic consecutive sampling procedure [27]. If the concordance with guidelines still was 80% or more, a new review was performed every six months. If the result was below 80%, the staff had to reflect and plan how to improve adherence to fulfil the 'stars' goal.

In this study one of the researchers (RMJ) was both process leader and researcher. The process leader task was to coach the coaches to improve the care, educate and facilitate coordination and practical issues. The researcher role was to collect and analyse data together with the research group, and give feedback, working together with the coaches, staff and leaders to identify causes for variation in the data and instigate ideas for improvement.

Data Collection

Data were collected through prospective and retrospective patient record review by RMJ. The manual patient record reviews were performed according to a protocol. To be included in the study the patients had to be 18 years or older; admitted to the orthopaedic ward during the selected weeks; assessed as having risk of UR or UR and/or treatment with IUC. Baseline data including age, sex and actual diseases/surgery were collected before the intervention. To study the impact of the interventions we identified the proportion of patients who had a 'perfect care' as process measure, and the proportion of patients with UR as an outcome measures. 'Perfect care' was defined as the staff having identified the risk of UR, performed bladder ultrasonography, handled and documented UR and urinary catheters as prescribed in the guidelines, in all four wards. In this study, urinary retention was defined as occurring when a patient is unable to pass urine and post-void residual urine is more than 400 ml and at risk of UR when post-void urine is more than 200 ml [18]. The intervention was started in March 2008 and prospective patient data were included every five weeks starting in April 2008 to May 2012 (except the weeks in June-August and the

last two weeks of December and the first two weeks of January).

Analysis

Difference in group characteristics is presented as means, standard deviations and percentage. Time series data was analysed using statistical process control techniques in order to detect significant changes over time. In particular, p-charts were used, which show fractions of non-conforming data, i.e., improvement related to the interventions. Control limits in the control charts were set at 3 sigma. Statistical Process Control (SPC) methods were applied for continuous data analysis [28]. SPC supports separating signal from noise that is distinguishing common-cause and special-cause variation.

Results

In the intervention Phase I, the guidelines were distributed and three learning events were held for coaches between February and September 2008. Thereafter the coaches were offered continued learning events every six months. The process leader supervised the coaches in using the PDSA model between the continued learning events until the ward had six subsequent measurements which adhered to the guideline in 80% of patients

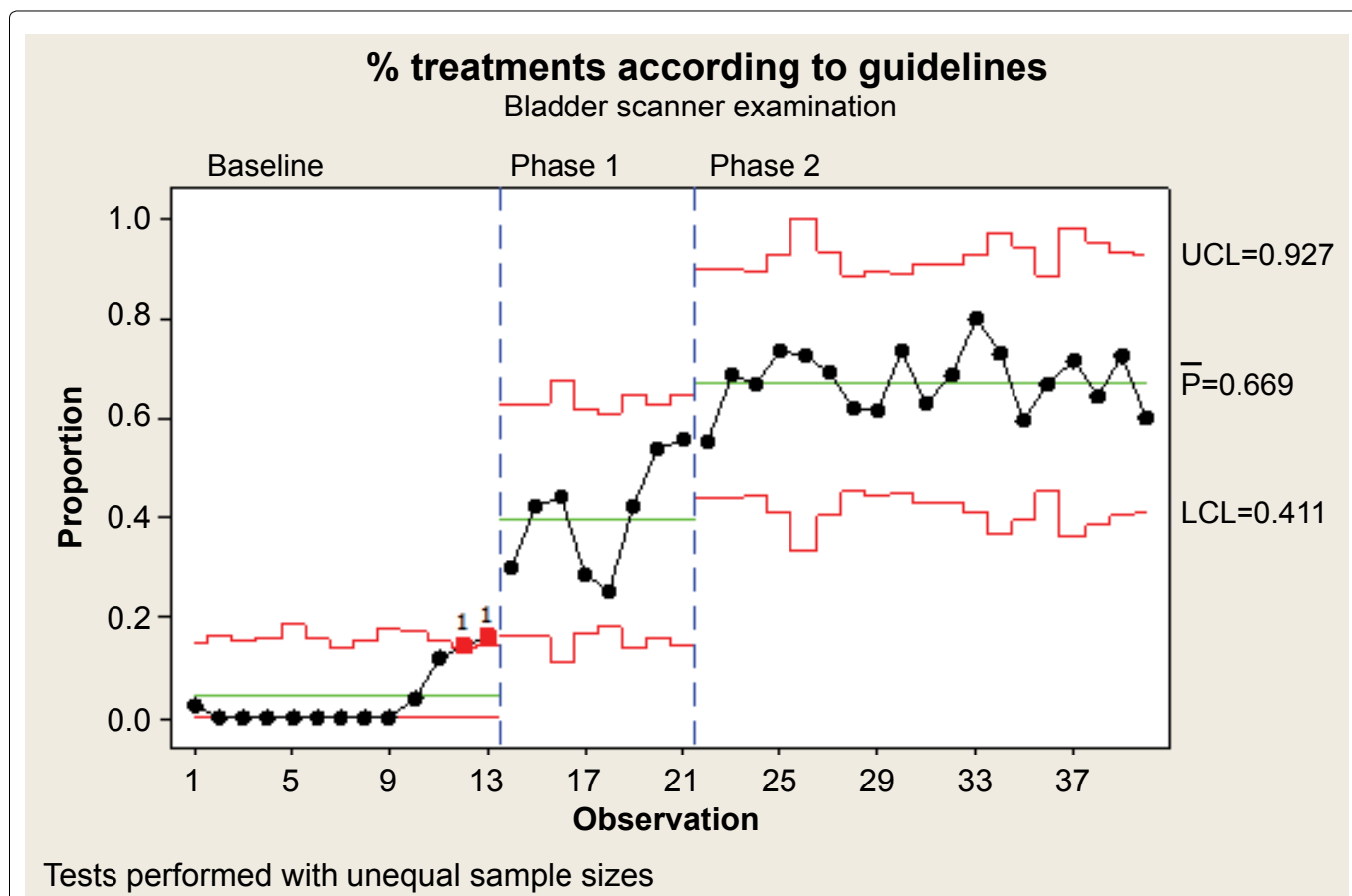


Figure 3: Percentage of orthopaedic patients at risk of UR, existed UR and/or treated with IUC who were treated according to the guidelines, as documented in the patient's record prior to and during the intervention. The phases are initiated after week 9, 13, and 17. The individual value is represented through the percentage of treatments according to guidelines. The observation on the x-axis is weekly basis.

UCL = Upper Control Limit, LCL = Lower Control Limit, \bar{P} = average of % treatments, ■ = significantly different from other values within the time period.

Table 1: Characteristics of the patients included in the study.

Variable		Baseline	Intervention period	
			Phase I	Phase II
		n = 247	n = 498	n = 574
Age year		64 (SD19.5)	67 (SD 18.5)	69 (SD 16.6)
Sex	n (%)			
male		143 (48%)	151 (36%)	259 (42%)
female		153 (52%)	269 (64%)	354 (58%)
Acute surgery	n %	100 (34%)	125 (30%)	206 (34%)
Elective surgery		105 (35%)	155 (37%)	242 (39%)
Acute illness, not surgery		91 (31%)	140 (33%)	165 (27 %)

or more. In October 2008, a delegation with a general ordination to treat patients with elective hip and knee surgeries with IUC was given to the nurses. The general ordination content instruction was to insert IUC at the operating theatre and end it at the postoperative care ward. This short-term IUC aimed at preventing UR during surgery. Statistical sampling was started on the four wards during the period 2008-2009 and was ended when each unit fulfilled the goal in the patient record review. A model of 'Standard care plans' about UR and IUC for each patient was developed in 2009. The national 'Safe Delivery' campaign was started in October 2008. One of the researchers (RMJ) gave feedback on results from the research record review and described patient cases when she met coaches at learning events, staff at meetings at each unit, and to specific physicians meeting once in 2008 and once in 2009. Adherence to guidelines in the intervention Phase I showed a rising adherence trend, but it was still an instable process during the period even if systematic improvements took place.

Intervention Phase II: The learning events continued, coaches were leaving and new coaches were educated during the period. The coaches started reviewing ten patient records every month between 2009 and 2011. The orthopaedic ward started in 2009 and fulfilled the goal with six subsequent measurements following the guidelines with 80% or more in February 2011. The postoperative care unit started in 2011 and ended in April 2012. The emergency unit started in 2010 and the operating theatre in 2011, and did not fulfil their goal until after the study period in 2013. There was sustained improvement, with an average 67% adherence according to the guidelines at a new, stable level (Figure 3).

During the four-year study period, a total of 1389 patient records have been reviewed, and 1319 (95%) of those patients had either UR or were at risk to get UR. The number of patients admitted to the orthopaedic ward and included in the study varied from 19 to 47 patients per week. Baseline data was collected during a nine-week period in 2007 and included 247 patients. Data in the intervention Phase I were collected during a 13-week period in 2007, which included 498 patients, and during Phase II for 17 weeks, which included 574 patients. The average age of the included patients was 64 at baseline and 69 at intervention Phase II. There were more women

in the intervention's Phase II, 354 (58%) compared with the baseline data 153 (52%). There was no difference between the groups according to acute surgery, elective surgery or acute nonsurgical illness (Table 1).

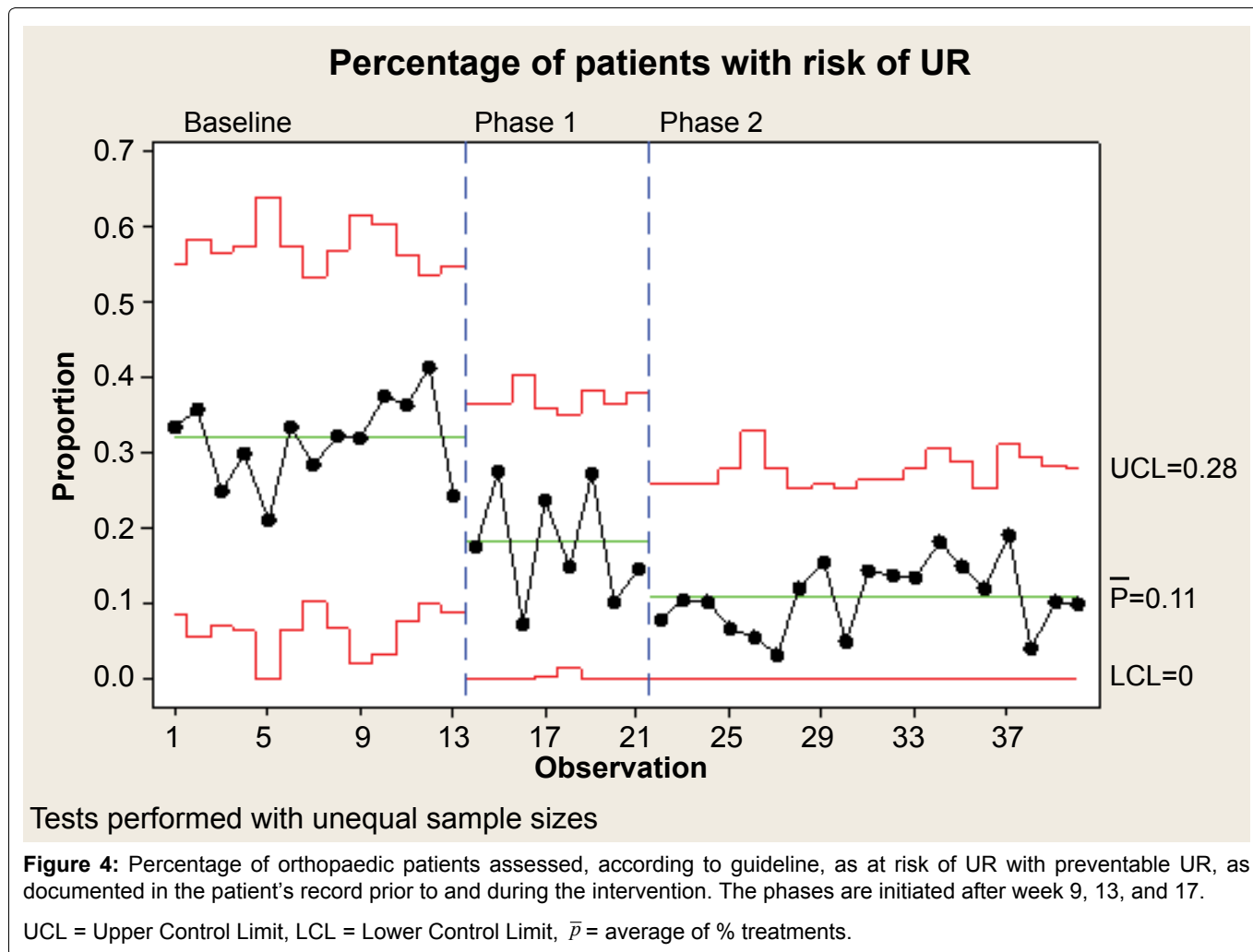
At baseline there were only two patients out of 296 who got care in complete accordance with the guidelines. Baseline indicates a very low level of treatments according to guidelines (near zero percentage). Phase I shows an increasing trend from the two first observations with signals below lower control limit and two signals at the end of Phase I with signals above the upper control limit. Phase II shows a pattern with high percentage of treatments according to guidelines (on average 67%). The last phase also exhibits a stable process pattern (Figure 3).

When > 200 ml post-void residual urine was used as an indicator for being at risk of UR a clear trend was seen. The baseline data indicates a high number of patients assessed (on average 60%), according to guidelines, as at risk of UR. Phase I shows a decreasing trend and the Phase II shows a pattern with low percentage of patients at risk of UR (on average 11%) (Figure 4).

Discussion

The review of the patient records shows that almost all patients in this orthopaedic study population had risk of UR, but there were no general guidelines on how to handle it before the intervention. This study shows an increased adherence to the guidelines over a two-year period with sustained results in the intervention Phase II, on average 67%. The proportion of UR was probably even higher in the group of patients at risk of UR before the intervention and in the group after the intervention handled without adherence to guidelines.

The result shows that it is possible to prevent UR arising in patients during orthopaedic care and treatment, and it is important to distinguish whether UR is an inevitable complication or if it is an adverse event that could have been prevented. By adherence to the suggested guidelines it is possible to start treatment of UR without delay, which decreases the risk of bladder damage and the need of treatment with urinary catheters [1]. With full adherence to the guidelines it may be possible to reduce UR further and increase the use of IUC on appropriate indications. Systematic implementation of evidence-based knowledge in clinical practice is challeng-



ing [29] and the knowledge from quality improvement research is still weak and under-theorized [30]. There is a need to bridge the gap between evidence, theory and practice by combining professional knowledge and quality improvement knowledge [31]. Developing the understanding of how QI intervention-programs work remains an important task, since such understanding is needed to avoid inappropriate interventions and learn from effective interventions [32].

Knowledge about contextual factors is important in quality improvement, [33] and therefore the coaches were important in this program, since they worked in their own familiar context and could understand how to use, adapt and transform the guidelines into their settings. Learning events and measurements were time-consuming both for the process leader and the coaches. Consequently, changes take time and the interventions need to be developed iteratively to be adopted to the local context [34]. In all participating units, other QI projects were ongoing simultaneously, and the process leader had to support and encourage coaches and wards individually to integrate the new guidelines into their local routines.

According to earlier studies, common barriers to 'Bladder Bundle implementation' and appropriate urinary catheter use include difficulty with nurse and physician engagement, patient and family request for in-

dwelling catheters, and catheter insertion practices and customs in the emergency department [35]. In this study the coaches were trained and served as mediators helping staff to incorporate the new guidelines in their local practice. The increased adherence to the guidelines measured after the test period indicate this to be one successful way to implement new routines into local practice. Other strategies to address barriers were identified as explicitly discussing the risks of indwelling urinary catheters with patients and families, and engaging with emergency department nurses and physicians to implement a process that ensures that appropriate indications for catheter use are followed [31]. In this study, the patients and families were not explicitly involved. Getting feedback on what you accomplish is an important part of change and improvement work [26,36]. The feedback presented at staff meetings about the fulfillment of goals according to patient records probably increased the consequent use of the guidelines. Health care staff needs to understand the benefit of measures and to enhance that, showing results and visualization locally are important [37]. This was therefore considered in those interventions, and the results were visualized on whiteboards in the unit's corridor and goal fulfillment was encouraged with the placement of 'gold stars' next to the results.

Limitations

In the baseline registration, patient record data was scanty and incomplete, which may have affected the outcome of the review false positively. There were also differences in the study groups between the two phases (Table 1). The patients were older during the intervention period and the proportion of women was higher compared to baseline, but there was no difference in the number of patients with urinary retention between the groups.

Conclusions

A systematic improvement process using coaches and improvement tools can increase the adherence to new guidelines and incorporate them sustainably into local practice. This study also shows that adherence to guidelines can improve patient care, in this case decrease the number of patients at risk of UR in an orthopaedic patient population. This methodology, to use an improvement program to implement guidelines would certainly be suitable in other care departments and patient populations not only in IUC treatments. The guidelines were designed in co-operation with practice, to be easy to use in clinical work.

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Contribution

ACA took over and finished the writing of the paper, RMJ was the project leader, collected and analyzed data, ME assisted and finished the analysis and commented on the paper, BAG assisted in designing the study and commented on the paper, LC assisted in designing the study, analysis and finishing the paper. All authors can take responsibility for the accuracy of data and analysis.

Competing Interests

The authors have no competing interests to declare.

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