



Original research article

Quality management as part of the prevention of healthcare associated urinary tract infection

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Abstract

Goal: The objective of this research was to determine whether hospitals have implemented risk management, including the monitoring of quality indicators related to the issue of prevention catheter-associated urinary tract infection. The monitoring of results and process-related quality indicators is one of many steps that should be taken to increase quality and safety in patient care.

Methods: This quantitative research was conducted in the form of a questionnaire survey.

Results: Result indicator monitoring or recording the number of cases of catheter-associated urinary tract infection, is performed in 33.3% of hospitals, and records of the number of catheter-days are kept in only one quarter of hospitals. We also demonstrated a statistically significant relationship between the above and an increase in qualifications in correct catheterisation procedures, care for patients with urinary catheters, and possibilities of catheter-associated urinary tract infection prevention ($p < 0.001$; $\chi^2 = 18.473$).

Conclusions: Quality management and risk identification are the responsibility of the management of healthcare providers, while it is the responsibility of the healthcare workers to provide competent care according to approved procedures.

Keywords: Audit; Nursing; Prevention; Quality indicator; Standard procedure; Urinary tract infection

Introduction

Established risk factors of catheter-associated urinary tract infection (CAUTI) include prolonged catheterisation, investigation or surgical procedures in the genitourinary tract area, repeated disconnection of the drainage system, healthcare worker incompetence, low quality nursing care, and the patient's health condition (Andreessen et al., 2012; Jain et al., 2015; Jindrák et al., 2014; Sujijantararat et al., 2005; Underwood, 2015). Monitoring of the risks for the development of CAUTI involves result and process-related indicators (Jindrák et al., 2014). The objective of the work was to map the implementation of quality of care management and risk management as part of the provision of nursing care in the context of prevention of urinary tract infections associated with health care in hospitals that provide acute bed care in the Czech Republic. The results of the monitoring of process-related and result-related quality indicators in terms of CAUTI prevention are also presented.

Hospitals are an environment where a patient is subjected to quite specific risks. These risks must be identified and characterised, and preventive measures must be implemented, which are subjected to subsequent evaluation (Brabcová et al., 2015). Patient safety concerns, expectations, as well

as the economic aspects of healthcare provision create legitimate demands for evidence of the quality of healthcare provided (Burston et al., 2014). Therefore, it is important, in this context, for the healthcare provider to account for clear arguments attesting to the quality of care through the monitoring of quality-of-care indicators.

The Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Centers for Disease Control and Prevention (CDC) have published an updated recommended procedure for the prevention of urinary tract infections associated with healthcare (Tenke et al., 2008). The Guideline for Prevention of Catheter-Associated Urinary Tract Infections presents the interventions of CAUTI prevention and is verified based on EBP (evidence-based practice). The Guideline for Prevention of Catheter-Associated Urinary Tract Infections recommends, in the context of quality and safety of care, that the number of CAUTI for 1,000 (urinary) catheter-days be monitored, as well as the number of secondary bloodstream infections originating in the urinary tract for 1,000 (urinary) catheter-days, and the number of catheterisation days (expressed in percent) (CDC, 2009). CAUTI monitoring is recommended in workplaces and in patients where bladder catheterisation is frequently indicated and in this case the risk of complications is high (Jindrák et al., 2014). Furthermore, as part of the process of increasing the quality and safety of patient care, it is also recom-

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mended to monitor process-related indicators in connection with the prevention of CAUTI (Krocová and Prokešová, 2022), especially the results of audits of care, the number of persons competent to perform urinary bladder catheterisation, and the results of audits of documentation concerning the keeping of records about indication and reassessment of the necessity of catheterisation (Jindrák et al., 2014). Nurses are the largest group of healthcare professionals and play a vital role in managing the quality of care. As part of their work, they can detect some adverse events that may pose a risk to patient safety (Savitz et al., 2005). The results of the comparison (Savitz et al., 2005) show different sets of quality indicators published by the Agency for Healthcare Research and Quality (AHRQ), the National Quality Forum (NQF), and the American Nurses Association (ANA), with recommendations related to CAUTIs made by the NQF, specifically tracking the prevalence of CAUTIs and the number of CAUTIs related to bladder catheterization (Savitz et al., 2005). The review (Burston et al., 2014) provided an overview of quality indicators monitored in nursing care. The data were the result of the processing of 40 studies and determined 43 verified indicators of nursing care quality (Burston et al., 2014). According to the review, most commonly used indicators are patient falls, pressure sores, medication mistakes, and mortality. The numbers of urinary tract infections are reported as a quality indicator in 13 studies (Burston et al., 2014). The authors (Burston et al., 2014) stated in their conclusion that in the case of quality-of-care indicators it is necessary to choose sensitive indicators, conduct their continual monitoring, and evaluate the results.

Materials and methods

Study design

The study was performed using the method of quantitative research, the data were analysed using mathematical-statistical methods.

Data collection

One of the research tools of the investigation was a standardised questionnaire that had previously been used in the project DUQuE – “Deepening our understanding of quality improvement in Europe”, specifically questionnaire D – system of improving quality in European hospitals (Questionnaire for quality managers/coordinators). The DUQUE project was supported financially by the 7th framework programme of the European Community (FP7/2007–2013) as part of Grant Agreement No. 241822. Consent to its use was obtained from the Project Coordinator and Head of Research of the DUQuE project, Prof Rosa Sunol. The questionnaire is available in the Czech language. It was shortened and modified for use in our research by adding our own questions. The questions in the non-standardised questionnaires were aimed at determining whether selected methods of quality improvement of nursing care in Czech hospitals are used. The questionnaires were modified to enable online data collection.

At the beginning of the investigation, a pilot study was performed in four hospitals, and the questions in the non-standardised questionnaires were then modified based on the responses received. The reliability of the non-standardized questionnaires was verified by Cronbach alpha test. In view of the questionnaire being distributed online, the data were exported on a trial basis, and relevancy was verified by a statistician.

Data analysis

Data analysis was performed using SASD 1.5.8 (statistical data analysis) and SPSS software. The process of analysis involved first- and second-degree classifications. As part of the relationship analysis, the chi-square test of goodness of fit χ^2 (Pearson Chi-Square) and an independence test, were applied according to the character of the signs and number of observations. A further procedure involved the calculation of the Pearson contingency coefficient, standardised Pearson coefficient of contingency, Čuprov's coefficient, Cramer's coefficient, the Wallace coefficient, and a correlation coefficient. The strength of the relationship was measured at three significance levels $\alpha = 0.05$; 0.01, and 0.001. As part of the description of the analysed statistically significant relationships, we included the values of the chi-square test of goodness of fit and the independence test.

Respondents

Respondents were nurses in senior and middle management positions at hospitals providing acute bed care in the Czech Republic. We contacted the non-physician healthcare management of all 194 hospitals that provide acute bed care in the Czech Republic, asking for their permission to conduct the research and to distribute a questionnaire to nurses in leadership positions (head and ward head nurses, principal nursing officers). Hospitals providing acute inpatient care were contacted according to a list of hospitals processed at the request of the Institute of Health Information and Statistics of the Czech Republic. After three rounds of contacts, 34 hospitals expressed their approval, and the questionnaires were completed by 186 respondents.

Results

There were 111 respondents from internal-type departments and 65 from surgery-type departments. Also included were 10 deputy directors for nursing care. 26.9% of respondents were from university hospitals, 33.9% from regional hospitals, 18.8% from private hospitals, and 15.0% from municipal hospitals. Ten respondents (5.4%) were “other” from the type of hospitals.

Findings on whether the activities performed in connection with advancing the quality of care depend on hospital type are presented in Table 1. The answers reflect the subjective statements of the respondents. Respondents were asked the question: “*What activities leading to an improvement in the quality of care are systematically performed and carried out by the management on a systematic basis?*” During the evaluation of these responses, no statistically significant relationship was found between hospital type and the characteristics, as shown in Table 1.

During the data analysis, it was determined that the performance of internal audits was confirmed by almost 100% of the respondents, while monitoring of quality indicators by healthcare providers was confirmed by 91%.

We also determined the relationships between hospital type and eight variables (areas) related to quality management and the monitoring of quality indicators connected to CAUTI prevention. These relationships are shown in Table 2. A statistically significant relationship between hospital type and the performance of regular audits of hand hygiene during the nursing of patients with urinary catheters was determined ($p < 0.05$, $\chi^2 = 13.252$). Audits are performed to a significant-

Table 1. Relationships – Hospital type and responses to the question “What activities leading to an improvement in the quality of care are systematically performed by the management?” and responses to the questions

Hospital type and...	χ^2 -value	<i>p</i>	Responses to items		
			Yes	Only in some departments	No
... root cause analysis of accidents	19.619	0.187	47.5%	23.2%	29.3%
... risk management	19.391	0.197	53.7%	30.7%	16.2%
... internal audit	12.910	0.609	97.2%	0.0%	2.8%
... performance of management checks	12.523	0.639	57.0%	37.4%	5.6%
... monitoring of nurses' work	13.571	0.558	49.2%	45.8%	5.0%
... monitoring of health care workers opinions	10.706	0.773	53.6%	43.6%	2.8%
... reporting and analysis of undesirable events	15.170	0.439	68.2%	29.0%	2.8%
... systematic checks of patient records	15.102	0.444	8.7%	10.2%	81.1%
... development of a comprehensive process of care	18.113	0.257	45.8%	49.2%	5.0%

Table 2. Relationships – Hospital type and variables related to quality management and monitoring of quality indicators in connection with CAUTI prevention

Hospital type and variables...	χ^2 -value	<i>p</i>
Evaluation of the risk of CAUTI	4.66	0.459
Performance of regular audits of data on urinary bladder catheterisation in medical records	4.737	0.449
Monitoring of the number of CAUTI cases	7.346	0.196
Monitoring of the number of cases of secondary bloodstream infections originating in the urinary tract	2.334	0.801
Monitoring of the number of catheter-days	1.747	0.883
Performance of regular audits of hand hygiene during the nursing of a patient with a urinary catheter	13.252	<0.05
Performance of regular audits of the use of gloves while nursing a patient with urinary catheter	3.691	0.595
Monitoring of the number of workers competent to introduce a urinary catheter	4.139	0.53

ly lesser degree in university hospitals and private hospitals. They are performed to a significantly higher degree in municipal hospitals and other types of hospitals.

We also determined a statistically significant relationship between conducting regular assessments of the number of healthcare workers competent to perform bladder catheterization and increasing competence in correct catheterization procedures, care of patients with urinary catheters, and opportunities to prevent CAUTI ($p < 0.001$; $\chi^2 = 18.473$).

Evaluation of the risk of CAUTI was confirmed by 26.8% of respondents. The maximum difference for the question of determining monitoring of the number of cases of urinary infection related to catheterisation was found between private versus regional hospitals. Overall, it can be stated that, according to the respondent answers, the maximum number of CAUTI cases registered is 33.3%. The number of catheter-days (related to the number of nursing days and expressed in %),

as an indicator of CAUTI quality, is then monitored according to only one quarter of the respondents. According to 80.1% of the respondents, regular evaluation of the number of healthcare workers with the competency to insert urinary catheters is not conducted. Table 3 presents the responses to questions on whether the healthcare provider monitors the result indicators related to CAUTI prevention.

In connection with the monitoring of process-related indicators, respondents were asked the following question: “Is the care for patients with urinary catheters regularly audited?”

The response *once a month up to every six months* was given by 35% of the respondents from surgical workplaces, and by 21% from internist workplaces. Similar results were found for the response *once a year* (33.3% respondents from surgical and 22.6% from internist workplaces). The variant *other* was mostly expressed as either never, or I do not remember. Chart 1 shows a graphical representation of the responses given.

Table 3. Monitoring of result indicators related to CAUTI prevention

Monitoring of result-related indicators related to CAUTI prevention	The number of cases of urinary tract infections related to catheterisation			The number of cases of secondary bloodstream infections originating in the urinary tract			The number of catheter-days (related to treatment days in %)			
	YES	NO	Overall	YES	NO	Overall	YES	NO	Overall	
Overall	Absolute frequency (n)	62	124	186	59	127	186	46	140	186
	Relative frequency %	33.3	66.7	100.0	31.7	68.3	100.0	24.7	75.3	100.0

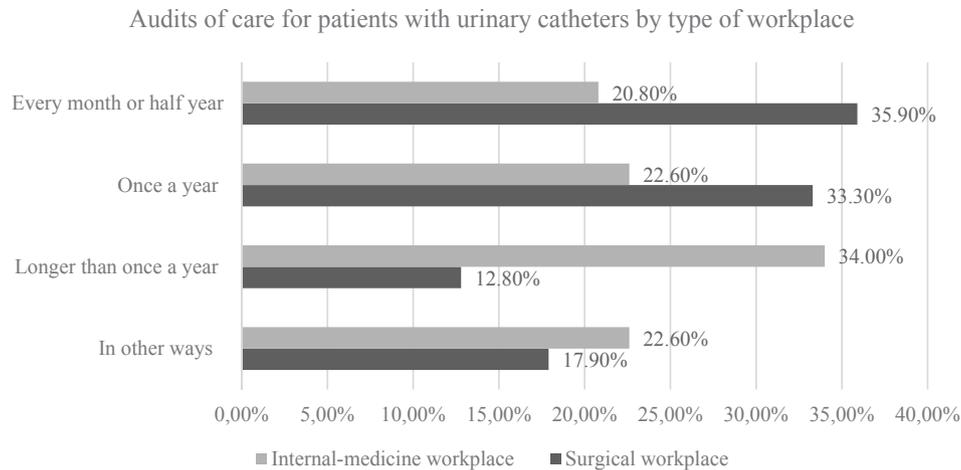


Chart 1. Responses to the question: “Is the care for patients with urinary catheters regularly audited?” (Responses by type of workplace)

Analysis of the data also demonstrated a statistically significant relationship between the existence of standards of care of patient with urinary catheter at the workplace and the performance of regular audits for patients with urinary catheter ($p < 0.001$; $\chi^2 = 31.371$).

Respondents also provided their opinion on the following statement, “There are regular audits at my workplace of the prevention standard for urinary tract infections related to the provided healthcare”. Agreement or full agreement with the statement was expressed by 45% of respondents from surgical workplaces, and by 40% from internal medicine workplaces. Disagreement was expressed by roughly 40% of respondents from internal-medicine and surgical workplaces. Again, in workplaces where there is a standard in place for the prevention of healthcare associated urinary tract infections, inspections are much more frequent ($p < 0.001$; $\chi^2 = 23.171$).

The statement “There are regular audits of the procedure of urinary bladder catheterisation at my workplace” was met with complete disagreement or disagreement by 43% of respondents from surgical workplaces, and by 37% of respondents from internal medicine workplaces.

A statistically significant relationship was also found between the type of workplace and sharing information with nurses about the quality of their care (in relation to the care of patients with indwelling urinary catheters). In surgical-type workplaces, this information is more frequently shared with non-physicians, whereas in non-surgical-type workplaces this happens significantly less ($p < 0.001$; $\chi^2 = 13.942$).

Discussion

The aim of this paper was to present the results of the investigation related to the monitoring of quality of care in patients with urinary catheters and the monitoring of quality indicators in this area. The results of responses to the question “What activities leading to an improvement in the quality of care are systematically performed by the management?” showed that most of the providers perform audits of care. They also monitor quality indicators and keep records of undesirable events. Checks of medical records (systematic checks of the patient’s records to determine the possible occurrence of undesirable events and quality management) were not confirmed by 8.7% of the respondents, and the requirements of the valid legisla-

tion should be stated in the context of the above. Flawlessness in recordkeeping is frequently regarded as being unnecessary by healthcare workers. Nevertheless, correct recordkeeping is an essential requirement for risk minimisation, and thereby the elimination of undesirable events (Savitz et al., 2005; Tóthová et al., 2014, pp. 99–107). Therefore, it should be considered as an instrument to ensure good-quality and safe care (Sysel et al., 2011). The Joint Commission on Accreditation (JCA) has paid great attention to the risks associated with medical record keeping (Šupšáková, 2017). The accreditation standards of SAK contain requirements for medical documentation and for the implementation of an internal directive from the organisation that sets out the conditions for keeping documentation and the inspection of this documentation according to the valid legislation (SAK, 2013). Specifically, the keeping of medical records about urinary catheters was dealt with by Quinn et al. (2020). Their research shows that particular importance should be paid to the standardisation of documentation, ensuring it is meticulously kept and lucid, and record checks (Quinn et al., 2020).

The respondents reported that almost 72.1% of providers ensure that healthcare workers are given access to education in the area of knowledge and skills (the latter of which aims to improve the quality and safety of the provided care). Healthcare education in the area of care for patients with catheters has been introduced as part of preventive measures, and a description of this education is given in the studies such as Alexaitis and Broome, 2014; Carter et al., 2014; Oman et al., 2012; Peter et al., 2018; Yatim et al., 2016. Roughly half of the respondents (48.6%) confirmed the implementation of risk management on the side of the healthcare provider, and 47.5% of the respondents confirmed the performance of a root cause analysis (RCA) of accidents. Aufseeser-Weiss and Ondeck (2001) reported that each nurse should have comprehensive knowledge of the quality of care. They should be informed about the currently valid legislation, monitor the quality of nursing care through regular audits, and be part of a team that is concerned with the issues of risk management in their respective facilities. The results of the RCA in relation to risk management will be verified by the authors in the form of interviews with the quality managers of the healthcare providers. The output of this may be influenced by the fact that the respondents included non-physicians from middle management who do not necessarily have to be part of e.g., quality teams in the provider’s

facility. A total of 73.2% of respondents stated that their facility does not conduct evaluations of the risk of urinary tract infections related to the introduction of urinary catheters. This will also be subject to verification in the interviews with the representatives of quality management in the respective healthcare facilities.

In the context of identifying the risk of CAUTI, the authors (Jindrák et al., 2014) recommend identifying patient groups and the type of ward where bladder catheterisation is frequently performed, as there is a risk of infection. In these cases, they recommend performing targeted monitoring. In the case of the question about monitoring of the result indicators of CAUTI, specifically about the monitoring of the number of cases of urinary infections related to catheterisation, 33.3% of respondents answered positively. The CAUTI quality outcome indicator, specifically the number of catheter days, is monitored according to a quarter of the respondents. According to 21.3% of respondents, the assessment of the risk of urinary tract infections related to an indwelling urinary catheter is performed. According to the research results, CAUTI result indicators are monitored to a greater extent at internal-type workplaces ($p < 0.001$; $\chi^2 = 8.954$). There were also interesting answers to the question of whether the facility monitors the process-related indicators of urinary tract infections related to an introduced urinary catheter. The observance of hand hygiene as part of nursing patients with urinary catheters was confirmed by 45.7% of respondents. 38.7% of respondents confirmed that audits on using gloves during attending to patients with urinary catheters were conducted. Regular evaluation of the number of healthcare workers competent to insert urinary catheters was mentioned positively by less than 20% of those questioned. In a review article, the authors (McNeill, 2017) state that caring for patients with a urinary catheter and collection system begins at the time of catheter insertion. It should include follow-up hand hygiene, hygiene of the urogenital area, and proper manipulation of the collection bag, which must be checked regularly. The introduction of standards of care for patients with urinary catheters and their regular audits have been recommended as an effective preventive measure (Carter et al., 2014; Oman et al., 2012; Peter et al., 2018; Purvis et al., 2014). Conway and Larson (2012) presented a comparison of recommended practices in CAUTI prevention from 1980–2010. As a basis for a CAUTI prevention strategy, professional societies recommend monitoring catheterization-related risk situations in the same way as information for staff (quality of care feedback) regarding audits and quality measures.

In this context, it is necessary to mention that 78.9% of respondents in the presented investigation stated that they receive feedback related to their patient care. The recommended procedures also mention motivation for collective responsibility for the quality of provided care in the case of CAUTI. It also followed from the investigation that motivation to improve quality of care was confirmed by almost 40% of respondents. In the above context, Carter et al. (2014) stated that the motivation for the hospital management to try to achieve safe and good-quality care is to maintain the reputation of the hospital, data mapping of the number of undesirable events including infections, as well as financial penalties from insurance companies.

The motivation for nurses in clinical practice is primarily the personal responsibility of healthcare professionals to provide patients with safe and quality care. In the case of CAUTI prevention, the motivation is a clear effort to provide the best

possible care, receive a positive appraisal of their work by their superiors, as well as the provided overviews of outputs from their work, and audit results etc. Senior management should provide a space for members of nursing teams to comment on the results and evaluation – and urge them to suggest steps for improvement (McNeill, 2017).

Limitations

Limitations included a low willingness of the hospitals to participate in research, even when assured it would be conducted in strict anonymity. A related limitation was the low number of respondents, partly due to the COVID-19 epidemiological situation. The research was limited in time, and there was no possibility, especially in the discussion, to compare the results of the research with a similar research survey conducted in the Czech Republic.

Conclusions

The article presents the results of a survey that maps the monitoring of indicators within CAUTI risk management for inpatient health care providers. It is also important to identify sensitive quality of care indicators that should be monitored and evaluated. In the case of CAUTI, it is recommended to monitor the quality of the result and process. In terms of process indicators, more than half of the respondents confirmed that care for patients with urinary catheters was performed at least twice a year. Preventive measures for CAUTI include the introduction of standard care procedures and control of their observance. Only in this way will continuous monitoring of the quality of nursing care be ensured. If the number of infections increases, a thorough examination and identification of risk areas and care processes is recommended. Quality management and risk identification are the responsibility of the management of the health care provider, especially the management of the departments providing direct care. The professional responsibility of healthcare professionals lies in providing care according to approved procedures and offering safe care in this way. Data can be a clear stimulus for the management of inpatient health care providers. However, there is a need to reflect on the data on hand hygiene audits and the use of gloves in the treatment of patients with urinary catheters. Both areas are an integral part of quality care, with hand hygiene and the use of gloves forming part of CAUTI prevention. The hospital management should verify the number of competent staff for bladder catheterization, it is also necessary to verify the acceptance of these competencies in clinical practice. Patient care should only be provided by an adequately qualified healthcare professional, and when the competencies of healthcare professionals related to bladder catheterization and catheterization care are clearly defined by applicable Czech legislation. It is very important to introduce educational programs for non-physicians in the field of CAUTI prevention.

Ethical approval

The study did not require ethical approval from an institutional review board. The management of hospitals where the respondents work gave their approval to the data collection. The authors can provide evidence of consent and all data on request.

Conflict of interests

The authors declare that there are no conflict of interests.

Management kvality jako součást prevence infekcí močových cest spojených se zdravotní péčí

Souhrn

Cíl: Cílem výzkumu bylo zjistit, zda bylo v nemocnicích zavedeno řízení rizik, včetně sledování indikátorů kvality v souvislosti s problematikou prevence infekcí močových cest spojených s katetrizací močového měchýře. Sledování výsledků a procesních indikátorů kvality jsou jedny z mnoha kroků, které by měly být podniknuty ke zvyšování kvality a bezpečnosti péče o pacienty.

Metodika: Tento kvantitativní výzkum byl prováděn formou dotazníkového šetření.

Výsledky: Monitorování ukazatelů výsledků nebo zaznamenávání počtu případů katérové infekce močových cest jsou prováděny ve 33,3 % nemocnic a počet katérových dnů eviduje pouze čtvrtina nemocnic. Prokázali jsme také statisticky významnou souvislost mezi výše uvedeným a zvyšováním kvalifikace v oblasti správných postupů katetrizace, péče o pacienta s močovým katérem a v možnostech prevence katetrizačních infekcí močových cest ($p < 0,001$; $\chi^2 = 18,473$).

Závěr: Řízení kvality a identifikace rizik je záležitostí managementu poskytovatele zdravotní péče, odpovědností kompetentních zdravotníků je poskytovat péči dle schválených postupů.

Klíčová slova: audit; indikátor kvality; infekce močových cest; ošetřovatelství; prevence; standardní postup

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