Z. Evid. Fortbild. Qual. Gesundh. wesen (ZEFQ) 195 (2025) 6–14

Contents lists available at ScienceDirect

Z. Evid. Fortbild. Qual. Gesundh. wesen (ZEFQ)

journal homepage: http://www.elsevier.com/locate/zefq

Qualität und Sicherheit in der Gesundheitsversorgung / Quality and Safety in Health Care

National improvements in falls and pressure injuries in Swiss hospitals from 2011 to 2022: A secondary data analysis of national quality monitoring data

Nationale Entwicklungen bezüglich Sturz und Dekubitus in Schweizer Spitälern von 2011 bis 2022: eine Sekundärdatenanalyse der nationalen Qualitätsmessung

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ARTICLE INFO

Article History:
Received: 19 June 2023
Received in revised form: 21 January 2025
Accepted: 16 March 2025
Available online: 22 April 2025

Keywords:
Falls
Hospitals
Healthcare quality indicators
Pressure injury
Prevalence
Quality improvement

ABSTRACT

Introduction: National quality monitoring in healthcare and, in particular, the (transparent) comparison of results can trigger improvements at the structural and procedural levels and, thus, improve the outcome. In Switzerland, this kind of monitoring was conducted between 2011 and 2022 (except 2020 and 2021 due to the COVID-19 pandemic) for falls and pressure injuries in the hospital setting. The aim of this study was to examine the improvements in the quality of care for falls and pressure injuries in Swiss hospitals during the monitoring period.
Method: A secondary data analysis was conducted of the Swiss national quality monitoring data on falls and pressure injuries based on a multicenter cross-sectional design. Descriptive data analysis was performed.
Results: The hospital-acquired pressure injury prevalence rate varied between 3.6% and 5.8%, and the in-hospital fall rate was between 3.0% and 4.6%. The prevalence rates showed their greatest decrease after the first monitoring, with only a slight decrease/stagnation observed thereafter. An increase in prevalence rates was revealed after the two-year monitoring break due to the COVID-19 pandemic. The structural conditions improved (e.g., implementation of guidelines) and more processes were implemented at the patient level (e.g., use of preventive measures) over the monitoring period. At the same time, patients tended to be older, more multimorbid, and more at risk of pressure injuries.
Conclusion: Considering the change in the patient population (higher risk) and the findings on the structure and process indicators, the improvement in quality of care is likely to be more pronounced than the prevalence rates suggest.

ARTIKEL INFO

Artikel-Historie:
Eingegangen: 19. Juni 2023
Revision eingegangen: 21. Januar 2025
Akzeptiert: 16. März 2025
Online gestellt: 22. April 2025

ZUSAMMENFASSUNG

Hintergrund: Nationale Qualitätsmessungen im Gesundheitswesen und insbesondere der (transparente) Vergleich der Ergebnisse sollen Verbesserungen auf Struktur- und Prozessebene anregen und dadurch einen Beitrag zu besseren Patient:innenergebnissen leisten. In der Schweiz wurde eine solche nationale Qualitätsmessung zwischen 2011 und 2022 (exkl. 2020 und 2021 aufgrund der COVID-19-Pandemie) hinsichtlich Sturz und Dekubitus im Spitalsetting umgesetzt. Das Ziel dieser Studie war es, die Qualitätsverbesserung bezüglich Sturz und Dekubitus in Schweizer Spitälern während der Messperiode zu untersuchen.

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https://doi.org/10.1016/j.zefq.2025.03.006
1865-9217/

Schlüsselwörter:
Dekubitus
Prävalenz
Qualitätsindikatoren im Gesundheitswesen
Qualitätsverbesserung
Spital
Sturz

Methode: Es wurde eine Sekundärdatenanalyse der nationalen Prävalenzmessung Sturz und Dekubitus der Schweiz durchgeführt, die auf einem multizentrischen Querschnittsdesign basiert. Die Daten wurden deskriptiv analysiert.
Ergebnisse: Die nosokomiale Dekubitusprävalenzrate schwankte zwischen 3.6 % und 5.8 %, die Sturzrate im Spital lag zwischen 3.0 % und 4.6 %. Die Prävalenzraten gingen nach der ersten Messung am stärksten zurück, danach war nur noch ein leichter Rückgang oder eine Stagnation zu beobachten. Nach der zweijährigen Unterbrechung der Qualitätsmessung aufgrund der COVID-19-Pandemie stiegen die Prävalenzraten deutlich an. Über die Messperiode hinweg verbesserten sich die strukturellen Voraussetzungen (z.B. Implementierung von Richtlinien) und es wurden mehr Prozessindikatoren auf Patient:innenebene umgesetzt (z.B. Einsatz von Präventionsmaßnahmen). Gleichzeitig wurden die Patient:innen tendenziell älter, multimorbider und wiesen ein höheres Dekubitusrisiko auf.
Schlussfolgerung: Angesichts der Veränderung in der Patientengruppe (höheres Risiko) und der Erkenntnisse zu den Struktur- und Prozessindikatoren dürfte die Verbesserung der Qualität ausgeprägter sein, als die Prävalenzraten vermuten lassen.

Introduction

Various measures are being taken internationally to improve the quality of healthcare. One popular strategy is to monitor and compare dimensions of healthcare quality [1]. Aspects of quality are quantified by means of quality indicators. According to Donabedian [2], quality can be measured at the structural, procedural and outcome levels. The benefit of quality monitoring goes beyond describing the actual state. Repeated monitoring suggests that prevalence rates tend to (further) decrease, that awareness of the measured quality indicators increases and that the targeted use of treatment and preventive measures improves or can be sustained [e.g., [3]]. Quality monitoring at the national level with transparent comparison of results at the outcome level are also known to trigger improvements at the structural and procedural levels [1]. In addition, the publication of transparent quality data is still considered key in terms of public accountability [1].

Two internationally established quality indicators in the hospital setting are inpatient falls and hospital-acquired pressure injuries (HAPI) [4]. In Switzerland, these two indicators were nationally monitored in all hospitals between 2011 and 2022 (except 2020 and 2021 due to the COVID-19 pandemic) and transparently compared on a risk-adjusted basis [5]. The internationally established and proven Landelijke Prevalentiemeting Zorgkwaliteit (LPZ) method was used for this purpose [6]. On one day per year, all hospitalised patients were directly assessed at the patient‘s bedside to determine whether a pressure injury was present and whether a fall had occurred in the hospital in the past 30 days. In addition to the outcome (patient fall/pressure injury), the structural conditions (e.g., availability of a guideline) and implemented processes (preventive interventions, e.g., regular skin inspections) related to the indicator/outcome were assessed within the LPZ method. The LPZ method could also be used to measure the quality indicators incontinence, malnutrition, restraints, and pain. However, these quality indicators are not available in the Swiss context (incontinence and pain) or hospitals only record the indicators on a voluntary basis without transparent publication of results (malnutrition and restraints). After 10 years of national monitoring with transparent publication of results at the outcome level of the quality indicators of fall and pressure injury, the question arises as to whether the quality of healthcare in Swiss hospitals has improved as intended regarding these two quality indicators. Therefore, the aim of this study was to examine the improvements in quality of care at the structural, procedural and outcome levels for falls and pressure injuries in Swiss hospitals between 2011 and 2022.

Material and methods

Study design

A secondary data analysis was conducted of the Swiss national quality monitoring data on falls and pressure injuries based on a multicentre cross-sectional design. This monitoring was started in 2011 and carried out once a year until 2022, with the exception of the two COVID-19 pandemic years 2020 and 2021. Since 2023, the measurement has been suspended in order to develop a new data collection method [7]. Accordingly, the data from the monitoring years 2011–2019 and 2022 are included.

Setting and sample

The national quality monitoring was conducted in all Swiss somatic acute care hospitals (regardless of hospital type) that had joined the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ) national quality contract. Participation in this contract is voluntary for hospitals. However, participation is often a requirement for receiving a service mandate with corresponding public funding. Accordingly, around 95% of all hospitals have joined the contract. The remaining 5% are mostly highly specialised private clinics.

On a cut-off day in November each year, all patients aged 18 and over who were hospitalised as inpatients in a Swiss hospital and who gave their oral or written informed consent to participate in the monitoring were assessed for falls and pressure injuries. Beginning in 2012, the emergency and post-anaesthesia care wards were explicitly excluded (in 2011, such an explicit exclusion was missing). Participation by maternity wards was voluntarily in 2011 and compulsory in 2012. Beginning in 2013, maternity wards were explicitly excluded from the measurement. There were no further inclusion or exclusion criteria for the present study.

Variables

The LPZ instrument was used for the Swiss national quality monitoring of falls and pressure injuries [6]. The instrument is built based on the theory of Donabedian (structures, processes, outcomes) [2]. Structural characteristics are measured at the hospital and ward levels and process characteristics, outcomes and patient characteristics at the patient level. Table 1 provides an overview of the variables included in this secondary data analysis. It includes a description of the variables of the LPZ instrument, and certain formulations may be similar to those found in other publications that also describe this instrument [e.g., [6,8]].

Table 1
Variables included in this study at different levels.

Level	Variable	Details/remarks
Hospital level: structures	Availability of a protocol/guidelines regarding falls/pressure injury (based on a(n) (inter)national guideline) within the institution (yes, no)	
	Availability of a multidisciplinary expert committee regarding falls/pressure injuries within the institution (yes, no)	2011: The multi-disciplinary criterion was missing, which would skew the results too much in the comparison across the measurement years. Therefore, the structural characteristics at the hospital level were not calculated for 2011.
Ward level: structures	Regular audits are performed on the ward level to ensure compliance with the protocol/ guidelines regarding falls/pressure injuries (yes, no)	
	All patients with a risk of fall/pressure injury are discussed within a multidisciplinary team on the ward (yes, no)	
	Recording the risk assessment for each patient in the patient file is the standard policy on the ward. [A risk assessment is carried out for all patients and the result of the assessment is recorded in the patient file. This approach adheres to standard policy in the ward.] (yes, no)	
	Forwarding information regarding risk assessment of the patient during admission, handover and discharge is standard policy in the ward. (yes, no)	
Patient level: outcome	Inpatient fall in the last 30 days in the hospital (yes, no)	
	Hospital acquired pressure injuries all categories (yes, no)	
	Hospital acquired pressure injuries categories ≥ 2 (yes, no)	As the identification of a category 1 pressure injury is challenging [12], HAPI category 2 and higher are subject to separate analysis.
Patient level: patient characteristics	Age in years (interval)	
	Female gender (yes, no)	
	Number of medical diagnosis groups/chapters according to International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10; interval) [13] in which the patient has active diagnoses (e.g. Chapter I Certain infectious and parasitic diseases (A00-B99))	Not the individual diagnoses but only the diagnosis groups/chapters according to the ICD-10 were assessed. 2011 & 2012: The registration of diagnosis groups was not 100% in accordance with ICD 10 (some diagnosis groups/chapters were not included). Therefore, the number of diagnosis groups for 2011 and 2012 was not calculated.
	Sum score Care Dependency Scale (CDS) (interval with a range of 15–75; 15 items [e.g., eating and drinking or mobility] are rated on a Likert scale from 1 to 5. Lower scores indicate higher care dependency. Interpretation of five categories: 15–24 completely dependent, 25–44 dependent to a great extent, 45–59 partially dependent, 60–69 independent to a great extent, 70–75 completely independent) [14]	2011: The assessment of the CDS was voluntary in 2011. In 2011, the CDS was completed for 54.5% of the participants, which must be considered when interpreting the results.
	Sum score Braden Scale (interval with range of 6-23; five items [e.g. moisture] are rated on a Likert scale from 1 to 4 and one item [friction and shear] is rated on a Likert scale from 1 to 3. Lower scores indicate higher pressure injury risk). For the analysis, the patients were categorised as either at risk of developing pressure injury or not based on a cut-off of ≤ 18. [11]	2016: The 2016 LPZ instrument did not include the Braden scale and, accordingly, no result for the risk assessment of pressure injuries is available for that year.
Patient level: processes	Processes PI: • regular skin inspection • reactive support surface (mattress/bed) • active support surface (mattress/bed) • seating support surface • tilt (wheel)chair • repositioning in bed according to a time schedule • floating heels/heel suspension devices • pressure relief of other body parts • mobilisation specific for preventing pressure injuries • moisturiser/barrier cream to protect the skin • prevention or treatment of hydration and/or nutrition deficits • patient education regarding prevention and/or management of pressure injuries • other interventions each (yes, no)	The following deviations existed. To avoid removing the variable for all years of monitoring, the relative frequency was calculated (see Statistical Analysis). 2011–2017: regular skin inspection was not assessed 2011 & 2012: only repositioning according to a time schedule in general was assessed, not specifically in bed and no repositioning in sitting (e.g., with a tilt wheelchair) 2011: mobilisation specific for preventing pressure injuries was not assessed
	Processes Fall • evaluation of current medication • evaluation of eyesight /vision • evaluation of footwear • evaluation of aid devices • evaluation of day programme/ activities • therapeutic exercises /training • one-to-one supervision • assisted walking • fall detection device • safety adaptation of environment • use of a low bed/mattress on floor and/or beside bed • patient education • agreement with patient and/or relatives about preventive interventions • use of other restraints [not specified, other than those already listed, e.g., bed rails] • other interventions each (yes, no)	The following deviations existed. To avoid removing the variable for all years of monitoring, the relative frequency was calculated (see Statistical Analysis). 2011–2014: use of a low bed/mattress on floor and/or beside bed was not assessed 2011: assisted walking, evaluation of footwear and use of other restraints were not assessed

The LPZ instrument has been annually evaluated by an expert group on LPZ measurement. These evaluations have led to various minor changes over the years, especially in wording. In 2016, however, the instrument underwent a fundamental revision and was subsequently re-launched as LPZ 2.0. In particular, the structural and procedural indicators were reviewed for their degree of informativeness and actuality, which resulted in a reduction in the number of items. No changes have been made to the outcome indicator over the years. The outcomes have been defined in the same way since the start of measurement in 2011. According to these definitions, 'A fall is any unintentional change in position that results in the client coming to rest on the ground or other lower level, regardless of the reason' [derived from the definition of [9]]. A pressure injury is defined as follows: 'A pressure ulcer [injury] is localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers [injuries]; the significance of these factors is yet to be elucidated' [[10], p. 12].

For the process indicators, the more detailed response options used until 2015 were summarised into the larger units used from 2016 onwards to achieve comparability across the monitoring years. For example, until 2015, various reactive support surfaces were separately surveyed (air mattress, cold-foam mattress, visco-elastic foam mattress, etc.). After 2016, the questionnaire was reduced to one question, 'reactive support surface (mattress/bed) - yes/no'. For the sake of comparability, the more refined, surveyed process indicators from previous years were combined into one binary answer. In the example mentioned, the different answer options were combined and converted into one binary answer. If one of the various reactive support surfaces was recorded before 2016, it was taken as a yes in the newly generated, binary variable, reactive support surface answer (mattress/bed).

For the structural indicators, some indicators could not be included in the analysis because they would have considerably changed the results (if there were no comparable, structural indicators in other years), thus limiting comparability over the monitoring years. Noticeably, no structural characteristic addresses staff training. This is because this structural characteristic and its operationalisation changed too much between the monitoring years. Until 2015, a question was asked about whether training for nursing staff on the prevention/treatment of falls/pressure injury was provided in the hospital. From 2016 onwards, a question was asked at the ward level as to whether all nursing staff (at least 80%) had attended training on falls/pressure injury. Inclusion of this variable at the hospital level until 2015 and at the ward level from 2016 onwards would have greatly changed the results, which could have led to a misleading interpretation of the trend in structural development.

With regard to patient characteristics, there were also changes in the LPZ instrument over the monitoring years. In particular, the fall risk assessment instrument changed over the monitoring years, so that no comparable risk assessment is available. Accordingly, no results on changes in the fall risk of the patient group can be presented in this study. The assessment instrument for pressure injury risk also changed over the years of measurement. However, the Braden Scale [11] was always part of the monitoring, except for 2016. Further changes affecting individual monitoring years are described in Table 1.

Data collection

On one day per year, data were collected by nurses (patient level) and hospital/ward managers (structural level) either directly in an online data entry programme or on paper with subsequent transfer to the online data entry programme. The outcome was assessed directly at the patient's bedside: For all participating patients, two nurses performed a skin inspection and asked the patient whether a fall had occurred in the hospital. The other data were either gathered directly at the patient's bedside or supplemented by consulting the patient's documentation. To ensure uniform data collection, the train-the-trainer method was used. The person responsible within the hospital for national quality monitoring of falls and pressure injuries (so-called coordinators) received overall training in executing the national quality monitoring process (administration, data collection, dashboard, fall and pressure injury-specific content) in an on-site training by the project team of Switzerland. The coordinators were then responsible for training the data collectors within the hospital on how to collect data. In addition, uniform data collection was supported by offering different documents (monitoring manual with definitions and detailed instructions, PowerPoint presentations and case vignettes for training purposes) that could be used for training as well as during the monitoring. Since the relaunch in 2016, all detailed information has been directly available in the data entry programme.

Statistical analysis

Descriptive analysis (mean, standard deviations, median, interquartile range, percentages and confidence intervals) was performed. For the structural and procedural indicators, the relative frequency was calculated across all indicators of a level subdivided by falls and pressure injuries. This means that the degree of fulfilment was not calculated per indicator; rather, the degree of fulfilment was calculated across all indicators (indicator 1 proportion yes + indicator 2 proportion yes + ... / number of indicators). This procedure allowed all indicators to be used for the process indicators, even if their numbers varied slightly over the years. The outcomes and process indicators were analysed at the patient level. The structural indicators were aggregated to the level at which they were recorded (hospital or ward). This means that the respective results refer to the number of participating hospitals or wards. Statistical significance of differences between monitoring years was considered on the basis of non-overlapping 95% confidence intervals. There are missing data points in the 2011 and 2012 data sets. These missing data points are either due to optional questions (e.g. 2011 CDS see Table 1) or system logic errors in the data entry programme (questionnaire could be completed even though data was missing). From 2013 onwards, the system logic was improved and there were no more optional questions for the indicators of falls and pressure injuries. Accordingly, the data sets from 2013 onwards do not include any missing data points. The missing data points are reported in the tables. For the statistical analysis, SPSS Version 28 was used [15].

Ethical considerations

The Ethics Advisory Board of the Bern University of Applied Sciences assessed the study plan and concluded that the study was not subject to the Swiss Human Research Act (October 2022, EAB2022_012). All data used in the present study were completely anonymised. The original data came from the Swiss national quality monitoring falls and pressure injury. No approval was required because quality monitoring does not fall under the Human Research Act in Switzerland. All participating patients received written information and gave their oral or written informed consent. The hospitals had the responsibility of documenting consent.

Results

Sample and outcome

As shown in Table 2, between 159 and 198 hospitals participated in the monitoring per year. The hospital size ranged from 1

Table 2
Patient characteristics, including in-hospital fall rates and hospital acquired pressure injuries (HAPI) prevalence rates in Swiss hospitals from 2011 to 2022.

Measurement year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2022
Participating hospital sites										
n	158	186	187	189	195	195	198	196	193	182
Participating wards										
n	1063	1263	1208	1191	1185	1166	1179	1145	1120	1058
Hospitalised patients 18 years or older										
n	15524	18105	17486	17550	17233	17619	17438	17250	17464	16507
Participating patients 18 years or older										
n	10574	13651	12903	13317	13163	13465	13227	13227	13240	12460
(%)	(68.1)	(75.4)	(73.8)	(75.9)	(76.4)	(76.4)	(75.9)	(76.7)	(75.8)	(75.5)
Age (Years)										
Mean	65.3	64.4	66.2	66.5	66.2	66.5	66.8	67.3	67.4	68.5
(SD)	(17.7)	(18.4)	(17.3)	(17.4)	(17.3)	(17.3)	(17.2)	(17.0)	(17.1)	(17.2)
Median	68.0	68.0	69.0	70.0	69.0	70.0	70.0	71.0	71.0	72.0
(IQR)	(25.0)	(27.0)	(24.0)	(24.0)	(23.0)	(24.0)	(24.0)	(23.0)	(23.0)	(22.0)
Sex (female)										
n	5481	7403	6498	6776	6586	6651	6549	6492	6504	6119
(%; 95% CI)	(51.8; 50.9–52.8)	(54.2; 53.4–55.1)	(50.4; 49.5–51.2)	(50.9; 50.0–51.7)	(50.0; 49.2–50.9)	(49.4; 48.6–50.2)	(49.5; 48.7–50.4)	(49.1; 48.2–49.9)	(49.1; 48.3–50.0)	(49.1; 48.2–50.0)
Number of medical diagnosis groups (ICD-10)										
Mean	-	-	2.8	3.0	3.1	3.2	3.4	3.3	3.5	3.6
(SD)			(1.9)	(2.0)	(2.0)	(2.0)	(2.1)	(2.1)	(2.2)	(2.2)
Median	-	-	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
(IQR)			(3.0)	(3.0)	(3.0)	(2.0)	(3.0)	(3.0)	(3.0)	(3.0)
CDS sum score (15–75)*										
Mean	64.9	65.3	64.7	65.1	65.2	65.4	65.0	65.1	64.6	63.9
(SD)	(13.6)	(13.3)	(13.5)	(13.2)	(13.2)	(13.0)	(13.1)	(13.1)	(13.3)	(13.9)
Median	71.0	71.0	70.0	71.0	71.0	71.0	70.0	70.0	70.0	70.0
(IQR)	(14.0)	(14.0)	(15.0)	(14.0)	(14.0)	(13.0)	(14.0)	(14.0)	(14.0)	(15.0)
Patients at risk of pressure injuries**										
n	2770	3679	3728	3767	3874	-	3871	4010	4100	4161
(%; 95% CI)	(26.3; 25.4–27.1)	(27.0; 26.2–27.7)	(28.9; 28.1–29.7)	(28.3; 27.5–29.1)	(29.4; 28.7–30.2)		(29.3; 28.5–30.0)	(30.3; 29.5–31.1)	(31.0; 30.2–31.8)	(33.4; 32.6–34.2)
Inpatient fall rate										
n	451	511	535	479	391	511	499	457	484	571
(%; 95% CI)	(4.3; 3.9–4.7)	(3.7; 3.4–4.1)	(4.1; 3.8–4.4)	(3.6; 3.3–3.9)	(3.0; 2.7–3.3)	(3.8; 3.5–4.1)	(3.8; 3.5–4.1)	(3.5; 3.2–3.8)	(3.7; 3.4–4.0)	(4.6; 4.2–5.0)
Hospital acquired pressure injury prevalence										
n	614	592	596	576	539	587	569	481	510	652
(%; 95% CI)	(5.8; 5.4–6.3)	(4.3; 4.0–4.7)	(4.6; 4.3–5.0)	(4.3; 4.0–4.7)	(4.1; 3.8–4.4)	(4.4; 4.0–4.7)	(4.3; 4.0–4.7)	(3.6; 3.3–4.0)	(3.9; 3.5–4.2)	(5.2; 4.9–5.6)
Hospital acquired pressure injury prevalence categories ≥ 2										
n	219	234	252	244	253	268	271	199	222	286
(%; 95% CI)	(2.1; 1.8–2.4)	(1.7; 1.5–1.9)	(2.0; 1.7–2.2)	(1.8; 1.6–2.1)	(1.9; 1.7–2.2)	(2.0; 1.8–2.2)	(2.0; 1.8–2.3)	(1.5; 1.3–1.7)	(1.7; 1.5–1.9)	(2.3; 2.0–2.6)
Hospital acquired pressure injury prevalence patients at risk of pressure injury**										
n	413	451	431	429	412	-	412	388	386	485
(%; 95% CI)	(14.9; 13.6–16.3)	(12.3; 11.2–13.4)	(11.6; 10.6–12.6)	(11.4; 10.4–12.4)	(10.6; 9.7–11.6)		(10.6; 9.7–11.6)	(9.7; 8.8–10.6)	(9.4; 8.5–10.3)	(11.7: 10.7–12.7)
Hospital acquired pressure injuries prevalence categories ≥ 2 patient at risk of pressure injury**										
n	154	180	194	190	200	-	210	162	170	232
(%; 95% CI)	(5.6; 4.8–6.5)	(4.9; 4.2–5.6)	(5.2; 4.5–6.0)	(5.0; 4.4–5.8)	(5.2; 4.5–5.9)		(5.4; 4.7–6.2)	(4.0; 3.5–4.7)	(4.1; 3.6–4.8)	(5.6; 4.9–6.3)

ICD-10: International Classification of Diagnoses 10th Revision [13]; *CDS:* Care dependency scale [14]; n=number; *SD*=standard deviation; *IQR*=interquartile range; 95% *CI*=95% confidence interval; -=no data available.

* Assessing of care dependency based on the CDS was voluntary in 2011 and was carried out in 54.5% (n=5768) of patients; 4 missing data points in 2012.

** Risk of pressure injury based on a Braden Scale score of ≤18 [11] – not assessed in 2016; 26 missing data points in 2011 and 2 missing data points in 2012.

Table 3
Structural and procedural indicators for falls and pressure injuries in Swiss hospitals from 2011–2022.

Measurement year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2022
Structural indicators hospital falls										
%	-	46.2	50.8	47.4	49.5	54.9	60.1	56.9	60.6	64.8
(95% CI)		(40.5–51.9)	(45.1–56.5)	(41.7–53.0)	(43.9–55.1)	(49.2–60.6)	(54.5–65.7)	(51.3–62.5)	(55.8–65.5)	(59.7–70.0)
Structural indicators hospital pressure injuries										
%	-	60.5	62.0	60.8	56.9	62.8	66.7	63.5	63.2	70.6
(95% CI)		(55.1–65.9)	(56.5–67.5)	(55.6–66.1)	(51.7–62.1)	(57.5–68.1)	(61.6–71.7)	(58.4–68.6)	(58.2–68.3)	(65.9–75.3)
Structural indicators ward falls										
%	66.8	64.8	65.3	65.1	69.5	78.6	77.9	81.1	80.8	79.3
(95% CI)	(64.9–68.7)	(63.1–66.5)	(63.7–66.9)	(63.4–66.9)	(67.9–71.0)	(77.1–80.2)	(76.3–79.5)	(79.6–82.5)	(79.4–82.2)	(77.8–80.9)
Structural indicators ward pressure injuries										
%	68.3	69.9	74.4	75.0	75.9	79.9	79.5	82.3	79.8	80.0
(95% CI)	(66.7–69.8)	(68.3–71.5)	(72.9–75.8)	(73.6–76.4)	(74.6–77.3)	(78.4–81.4)	(78.0–80.9)	(81.0–83.7)	(78.4–81.3)	(77.5–80.5)
Procedural indicators falls										
%	12.8	14.5	16.4	17.3	17.5	18.3	20.6	22.5	23.1	24.8
(95% CI)	(12.5–13.2)	(14.2–14.8)	(16.1–16.7)	(17.0–17.6)	(17.2–17.8)	(18.0–18.6)	(20.3–20.9)	(22.1–22.8)	(22.8–23.5)	(24.5–25.2)
Procedural indicators pressure injuries										
%	14.7	19.1	19.0	19.7	21.0	16.8	18.7	22.6	22.9	23.4
(95% CI)	(14.4–15.0)	(18.8–19.4)	(18.7–19.3)	(19.4–20.0)	(20.7–21.3)	(16.5–17.1)	(18.4–19.0)	(22.3–22.9)	(22.6–23.2)	(23.1–23.8)
Process indicators pressure injuries only patients at risk of pressure injury*										
%	31.1	35.6	34.2	34.6	37.1	-	33.3	36.9	37.4	37.0
(95% CI)	(30.3–31.9)	(35.0–36.3)	(33.6–34.8)	(34.0–35.2)	(36.5–37.7)		(32.7–33.9)	(36.3–37.5)	(36.8–38.0)	(36.4–37.6)

95% *CI*=95% confidence interval; -=no data available.
* Risk of pressure injury based on a Braden Scale score of ≤18 [11] – not assessed in 2016.

to 900 beds (based on the information in the monitoring on the number of hospitalised patients). In the first year of monitoring, there were considerably fewer hospitals taking part (158) than in all subsequent years (around 190 in each year). Between 10,574 and 13,651 patients participated in the monitoring per year. The participation rate ranged between 68.1% to 76.7%. Both the mean and the median showed that the average age of the participating patients slightly increased over the years (lowest mean in 2012: 64.4 years; highest mean in 2022: 68.5 years; lowest median in 2011 and 2012: 68.0 years; highest median in 2022: 72.0 years). There was also an increase in the proportion of patients at risk of pressure injuries based on the Braden scale (Braden score of ≤18; 2011: 26.3%; 2022: 33.4%). An increase can also be seen in the mean number of International Statistical Classification of Diseases and Related Health Problems (ICD) diagnosis groups registered since 2013. In 2013, the mean was 2.8 ICD diagnosis groups per patient, reaching a maximum of 3.6 in 2022. However, the median number of ICD diagnosis groups remained constant at 3.0. The care dependency of the patients also remained relatively constant. The mean value showed that the participants were independent in their care to a great extent (CDS score 63.9–65.4), and the median showed that the majority of participants were completely independent in their care (CDS score 70–71).

The in-hospital fall rate varied between 3.0% to 4.6% (Table 2). After the first monitoring in 2011, the in-hospital fall rate decreased, reaching a low of 3.0% in 2015, and then slightly rose again. After the two-year monitoring break due to the COVID-19 pandemic, the highest in-hospital fall rate since the start of monitoring was recorded at 4.6%. The HAPI prevalence rate varied between 3.6% and 5.8% with a decreasing trend over the years of monitoring until 2019. After the monitoring break due to the COVID-19 pandemic, the rate reached 5.2% in 2022. This means that the rate was at a similar level to when monitoring began in 2011. The HAPI prevalence of category 2 and higher varied between 1.5% and 2.3%. Here, too, the highest rate since the start of monitoring was observed after the two-year break in monitoring due to the COVID-19 pandemic. However, based on the 95% confidence interval, the fluctuations between the measurement years are mostly within the random range. The HAPI prevalence rate for patient at risk varied between 9.4% and 14.9%. Similar to the rate in the total population, a decreasing trend was observed until 2019 (9.4%). After the two-year monitoring break due to the COVID-19 pandemic, the rate rose again to 11.7%. The HAPI prevalence of category 2 and higher for patients at risk varied between 4.0% and 5.6%. Similar to the total population, the fluctuations based on the 95% confidence interval are mostly within the random range.

Structures and processes

For both falls and pressure injuries, the degree of fulfilment of the structural indicators tended to increase over the years of monitoring (Table 3). For falls, the degree of fulfilment at the hospital level was below 50% in 2012 and increased to over 60% in 2017, 2019 and 2022. For pressure injuries, the degree of fulfilment remained above 60%, except in 2015, with a maximum of 70.6% in 2022. An increase in the degree of fulfilment of the structural indicators over the years was also observed at the ward level. For both falls and pressure injuries, the degree of fulfilment started in 2011 at slightly below 70%. While the degree of fulfilment for pressure injuries reached over 70% by 2013 and showed a continuous improvement to 82.3% in 2018, the degree of fulfilment of the structural indicators at the ward level for falls did not exceed 70% until 2016, with further improvement to 81.1% in 2018. For both indicators, the degree of fulfilment at the two last monitoring in 2019 and 2022 was slightly lower than in 2018. The process indicators also showed an improvement over the years of monitoring (Table 3). In 2011, an average of 12.8% of all possible measures for the prevention of falls was implemented per patient; in 2022, that value amounted to 24.8%. In the case of pressure injuries, 14.7% of all possible process indicators were implemented per patient in 2011. In 2022, the proportion reached 23.4%. A noticeable decline after 2015 can be seen in the course. It is possible that this is related to the revision of the LPZ instrument (more detailed answer options until 2015). However, the increase has continued again since 2018. A similar trend in the fulfilment of process indicators is observed for patients at risk of developing pressure injuries. In 2011, an average of 31.1% of all possible process indicators were implemented per patient at risk. This value increased until 2015 (37.1%), then decreased slightly and reached a similar level to 2015 from 2017 onwards.

Discussion

We conducted a secondary data analysis of the national quality data on falls and pressure injuries in Swiss hospitals from 2011 to 2022 regarding quality-of-care improvement. The prevalence rates had the strongest decrease after the first monitoring, and only a slight decrease or stagnation was observed thereafter until 2019. After a two-year monitoring break due to the COVID-19 pandemic, all prevalence rates were higher than in 2019 and even reached values in the range of the first monitoring year. The structural conditions improved over the monitoring years, that is, the structural indicators were better implemented in the hospitals. At the patient level, the implementation of procedural indicators per patient also increased over the monitoring years, that is, preventive measures were implemented more frequently. If only the data up to 2019 is considered, stagnation occurred at the outcome level, while improvement at the structural and procedural levels continued. For 2022, considerably higher prevalence rates emerged with similarly implemented structural and process indicators compared to previous monitoring years.

The Swiss prevalence rates lie in the lower range of the internationally published rates. For in-hospital falls, the international inpatient fall rates range up to 9.2% [e.g., [16]]. Thus, even the high Swiss in-hospital fall rate of 2022 (4.6%) is just in the lower range. Fall rates are often also reported per 1000 patient days. However, this information cannot be compared with our data. For HAPI across all categories, prevalence rates of 0.2–26.3% are reported internationally [e.g., [3,17,18–20]], which places the most recent prevalence rate of 5.2% from Switzerland in 2022 in the lower range. For HAPI category 2 and higher, prevalence rates of 2.1–5.1% are reported internationally [e.g., [18,19]]. Thus, the most recent Swiss prevalence of 2.3% in 2022 is also in the lower range. In previous monitoring years, values even below the international range were observed. For HAPI for patients at risk, no comparable data is available (different risk assessment instruments, different or not reported cut-offs, different population, information only on pressure injury prevalence but no separate information on HAPI prevalence, prevalence per 1000 patient days [e.g., [21]]). As results are influenced by different assessment instruments and methods, inclusion and exclusion criteria and time periods, comparisons of prevalence rate must be interpreted with caution.

The increase in prevalence rates in 2022 after the two-year monitoring break due to the COVID-19 pandemic is striking. Since no COVID-19-specific data are available and no data are available for 2020, 2021 or after 2022, it cannot be assessed whether the results are influenced by effects related to the COVID-19 pandemic or whether an increasing trend is emerging. There are indications that during and after the pandemic, respectively, falls and HAPI prevalence rates have increased [22–24]. The reasons are manifold. Among other things, staff shortages and high patient volumes are described as possible causes. With regard to falls, the more frequent occurrence of cardiac arrhythmias in COVID-19 patients, which lead to an increased risk of falling, is pointed out [24]. With regard to pressure injuries, the prone position and ventilation of COVID-19 patients is described as being associated with an increased incidence of pressure injuries [25]. Since the structure and process indicators were implemented in 2022 to a similar extent as before the COVID-19 pandemic, it seems likely that the increased prevalence rates are related to COVID-19-specific effects.

The degree of fulfilment of the structural and procedural indicators more-or-less continuously increased over the years of monitoring. International comparisons are difficult because hardly any such data are available. This may be due to the fact that data on structural and process indicators are collected in a less standardised way and are therefore less comparable [26]. Although falls and pressure injuries are established phenomena in hospitals and their prevention has received much attention in the past decades, our data show that there is still room for improvement. On average, even 11 years after the start of monitoring, only 70% of the structural indicators were met at the hospital level. These structural indicators are internationally recommended, such as the provision of a guideline [27]. The reason for this could be that other topics receive more attention, for example, due to the target population of the hospital. In the national quality monitoring in Switzerland, all hospitals are involved, including those that, for example, specialise in ophthalmology. In such hospitals, pressure injuries might be given less attention compared to other phenomena. Interestingly, an increase in the fulfilment of structural indicators at hospital level, particularly for pressure injuries, between 2019 and 2022 can be seen. A correlation with the increased incidence of pressure injuries during the COVID-19 period is possible. In general, a higher degree of fulfilment of the structural indicators at the ward level was found. This may indicate that quality development with regard to falls and pressure injuries is more likely to take place at the ward level than at the hospital level. However, this result may also be related to the specialised clinics. Specialised clinics tend to be smaller than general hospitals, which means that proportionally, more wards that belong to a general hospital participate in the measurement. In general hospitals, falls and pressure injuries likewise receive more attention at the hospital level. The increase in the degree of implementation of the procedural indicators is also an indication that quality development has taken place. A multi-intervention approach for the effective prevention of falls and pressure injuries has been recommended for some time [28,29], and the results might reflect an increase in its implementation, as proportionally, more interventions for prevention were taken. In addition, the development of materials and their availability has improved in recent years. In Switzerland, for example, passive pressure-relieving mattresses have become standard components of hospital beds in many hospitals, which may have influenced the results. It is also not desirable that the procedural indicators reach 100%. A fulfilment of 100% of the procedural indicators would mean that all prevention measures would be applied to every patient irrespective of a risk assessment and probably without indication, which would not be justifiable from an ethical and health economic point of view. Accordingly, it is a positive finding that more procedural indicators are being implemented for patients at risk.

Interestingly, the patient characteristics indicate that the patients became older (mean age increased from 65.3 to 68.5 years and median from 68.0 to 72.0 years, respectively) and were more at risk of pressure injuries (the proportion of patients at risk of pressure injuries increased from 26.3% to 33.4%) during the period studied. Based on the number of ICD-10 diagnosis groups, there were also indications that the proportion of seriously ill patients had grown. The average number of ICD-10 diagnosis groups increased, while the median number of ICD-10 diagnosis groups remained constant. Despite this change in the population, which could potentially have led to higher prevalence rates for both HAPI and falls, the prevalence rates were constant before the COVID-19 pandemic. This, in turn, may reflect improvements at the structural and procedural levels. Without the improvement at the structural and process level, the prevalence rates would potentially have increased even before the COVID-19 pandemic. Very comparable findings on pressure injuries have been reported in Sweden [17]. In a national survey on pressure injuries in which a very similar approach is described, similar trends are described over 10 years. Although the study from Sweden mainly refers to pressure injuries in general and only specifies HAPI for the last 3 years, it is also evident in Swedish hospitals that the proportion of patients at risk for pressure injuries is increasing, the prevalence rates have been decreasing, and preventive measures are increasingly being taken.

Stagnating prevalence rates can thus also be an indication of a positive development in the quality of care when considering demographic developments. For Switzerland, the improvement in quality of care regarding falls and pressure injuries in hospitals is likely to be more pronounced than the prevalence rates suggest when considering the change in the patient population (higher risk) and the findings on the structure and process indicators. However, in view of the demographic trend and staff shortages pressure injury and fall prevention in hospitals will continue to gain importance [30]. Incentives at the health system level (e.g. national monitoring with transparent, risk-adjusted publication of results) are likely to continue to be useful measures to promote good healthcare quality with regard to falls and pressure injuries.

Limitations

We included a reasonably representative national sample, which had a positive impact on generalisability for Switzerland. In addition, an internationally proven procedure was used for data collection, which is likely to have had a positive influence on data quality. Nevertheless, some limitations should be noted. First, the participation rate of patients did not reach 80% in any year. Thus, it is possible that the most vulnerable patients were not represented in the data, leading to underestimation and corresponding bias in the results (selection bias). There could also be a recall or documentation bias in the case of falls since falls in hospitals were assessed over a maximum period of 30 days. Second, there were minor differences in the questionnaire between the monitoring years and a major change in 2016. The influence of these changes on the results cannot be quantified. Third, certain procedural indicators had to be combined for the sake of comparability, which could have affected the results. In addition, certain indicators were no longer included in the structural indicators as of 2016, which is why they were omitted from the analysis altogether. However, as the 2016 questionnaire revision was based on the latest evidence, the omission of the earlier additional structural indicators influenced the interpretation of the findings in the sense of the latest evidence.

Conclusions

National quality monitoring in healthcare with transparent publication of results is a strategy for initiating quality development. In Switzerland, such a national quality monitoring approach was conducted between 2011 and 2022 (except 2020 and 2021 due to the COVID-19 pandemic) for falls and pressure injuries in the hospital setting. The results of this secondary data analysis show an improvement in the quality of care regarding falls and pressure injuries in Swiss hospitals. As a consequence, prevalence rates decreased (except 2022, where an influence of the COIVD-19 pandemic is suspected), and the degree of fulfilment of structural and procedural indicators increased. Since at the same time, patients in hospitals tended to be older, more multimorbid and more at risk of pressure injuries, the improvement in quality of care might have been even more pronounced than the prevalence rates suggest. It appears, therefore, that the chosen strategy of national monitoring of falls and pressure injuries in Switzerland has had the positive effect described in theory (raising awareness, agenda setting, development of structures and processes).

Data availability statement

The data that support the findings of this study are available from the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ). Restrictions apply to the availability of these data, which were used under license for this study. Data must be requested in accordance with the „Empfehlungen Verwendung von ANQ-Daten zu Forschungszwecken [Recommendations for the use of ANQ data for research purposes]“, which can be found at https://www.anq.ch.

Institutional review board statement

The Ethics Advisory Board of the Bern University of Applied Sciences assessed the study plan and concluded that the study was not subject to the Swiss Human Research Act (October 2022, EAB2022_012). All data used in the present study were completely anonymised. The original data came from the Swiss national quality monitoring falls and pressure injury. No approval was required because quality monitoring does not fall under the Human Research Act in Switzerland. All participating patients received written information and gave their oral or written informed consent. The hospitals had the responsibility of documenting consent..

Funding

This work was supported by the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ). The data collection was funded as part of the ‘falls and pressure injuries’ national quality monitoring by the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ).

Acknowledgment

We thank the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ) for their financial support in conducting the present study and all the hospitals and patients for their participation in the quality monitoring. The data collection was funded as part of the ‘falls and pressure injuries’ national quality monitoring by the Swiss National Association for Quality Development in Hospitals and Clinics (ANQ).

Conflict of interest

All authors declare that there is no conflict of interest.

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Silvia Thomann: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Roles/Writing – original draft. Raya Zimmermann: Conceptualization, Formal analysis, Investigation, Methodology, Writing – review & editing. Joëlle Sina Riedweg: Project administration, Visualization, Writing – review & editing. Niklaus Stefan Bernet: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – review & editing.

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