Washington University in St. Louis
School of Medicine

First surveillance - then intervention: Insights on CAUTI from a national perspective

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AS/IP/IS Symposium

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Washington University in St. Louis
School of Medicine

- No conflicts of interest to declare
- Swiss National Science Foundation project grant, 2018-2022, on surgical site infections (PI)
- Collaborator in research on OPAT (NIH), SSI (CDC), and CAUTI (SNSF)
- Consultant for National Center for Infection Control, Bern, Switzerland

Surveillance of healthcare-associated infections (HAI), 10 years ago

United States

- SSI
- CLABSI
- CAUTI
- CDI

Switzerland

- SSI
- (HAI point prevalence study)

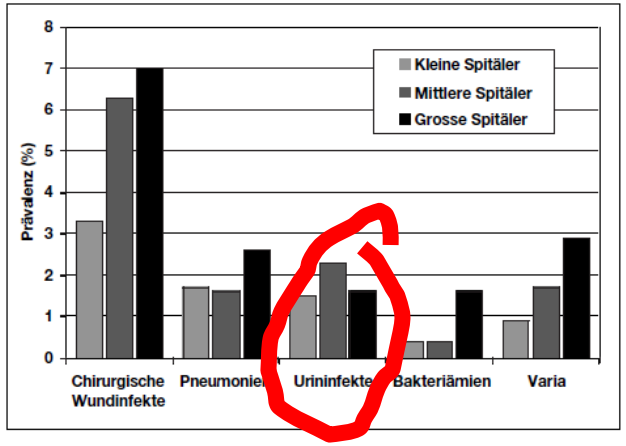


Abbildung 6 Schweizerische Prävalenzstudie der nosokomialen Infektionen 2002 (SNIP 02): Prävalenz der häufigsten nosokomialen Infektionen

Sax et al, Ther Umsch 2004

Catheter-associated urinary tract infection (CAUTI)

Art. 5 Nationale Programme

[1] Das Bundesamt für Gesundheit (BAG) erarbeit
Programme zur Erkennung, Überwachung, Verl

swissnoso
Nationales Zentrum für Infektionsprävention

"Jonas, would you be interested in helping with…?"

Swiss Confederation
Federal Department of Home Affairs FDHA
Federal Office of Public Health FOPH

NOSO Strategy

patient safety switzerland
patientensicherheit schweiz
sécurité des patients suisse
sicurezza dei pazienti svizzera

A pilot project is born

- First collaboration between Patient Safety Switzerland and the National Center for Infection Prevention
- Focus not only on CAUTI but also non-infectious complications of catheterization
- Goals were...to raise awareness for one type of device-associated infection across Switzerland, determine the burden of urinary catheter complications, and reduce catheterization

Lo et al, Strategies to prevent CAUTI in acute care hospitals: 2014 Update, Infect Control Hosp Epidemiol 2014.
Saint et al, A program to prevent CAUTI in acute care, NEJM 2016.

Table 1. Program Recommendations and Examples of Interventions.*

Recommendation	Example of Intervention
Primary	
Conducting daily assessment of the presence of and need for an indwelling urinary catheter	Conducting daily nursing rounds to review urine-collection strategies, including indications for continued urinary-catheter use
Avoiding use of an indwelling urinary catheter by considering alternative urine-collection methods	Promoting the use of condom catheters, bladder scanners, intermittent straight catheterization, and accurate measurement of daily weight (all in lieu of indwelling urinary catheters)
Emphasizing the importance of aseptic technique during catheter insertion and proper maintenance after insertion	Developing or updating the catheter-insertion policy to include all the proper steps, developing competencies for health care workers who insert catheters, and considering periodic audits of catheter placement

JAMA Internal Medicine | Original Investigation

A Multicenter Study of Patient-Reported Infectious and Noninfectious Complications Associated With Indwelling Urethral Catheters

Sanjay Saint, MD, MPH; Barbara W. Trautner, MD, PhD; Karen E. Fowler, MPH; John Colozzi, BA; David Ratz, MS; Erica Lescinskas, MD; John M. Hollingsworth, MD, MS; Sarah L. Krein, PhD, RN

- 2015-2017
- 4 U.S. acute care hospitals
- 2076 patients enrolled and followed for 30d after catheterization
- 124 w/ symptoms and Foley in place

Specific Complication	No. (%) Catheter in Place (n = 124)
Infectious complication	19 (15.3)
Fevers, chills, burning with urination, urinary frequency, urinary urgency, or other symptoms suggestive of an infection that required you to see a physician	12 (9.7)
Told you have a urinary tract infection	16 (13.0)
Noninfectious complication	87 (70.2)
Pain or discomfort	67 (54.5)
A sense of urgency or bladder spasms	43 (34.7)
Blood in the urine	34 (27.4)
Trauma to your skin related to catheter securement or catheter placement	24 (19.4)

Saint et al, JAMA Intern Med 2018

The study in a nutshell

- Pre/post intervention study, 2015-18
- Evidence-based intervention bundle
- Primary endpoint: urinary catheter utilization
- Piloting CAUTI surveillance & intervention

CATEGORY 1.

QUASI-EXPERIMENTAL DESIGNS THAT DO NOT USE CONTROL GROUPS

1. The 1-group pretest-posttest design:
   O1 X O2
2. The 1-group pretest-posttest design that uses a double pretest :
   O1 O2 X O3
3. The 1-group pretest-posttest design that uses a nonequivalent dependent variable:
   (O1a, O1b) X (O2a, O2b)
4. The removed-treatment design:
   O1 X O2 O3 removeX O4
5. The repeated-treatment design:
   O1 X O2 removeX O3 X O4

CATEGORY 3.

QUASI-EXPERIMENTAL DESIGNS THAT USE CONTROL GROUPS AND PRETESTS

1. Untreated control group design that uses dependent pretest and posttest samples:
   O1a X O2a
   O1b O2b
2. Untreated control group design that uses dependent pretest and postest samples and a double pretest:
   O1a O2a X O3a
   O1b O2b O3b
3. Untreated control group design that uses dependent pretest and posttest samples and switching replications:
   O1a X O2a
   O1b O2b X O3b

Harris et al, CID 2004

Intervention bundle

Less frequent

Catheter insertion only when indicated

> Indication list, consider alternatives

Shorter

Catheter to be removed as soon as possible

> Daily reevaluation, with reminders or stop orders

Safer

Catheter to be placed and maintained correctly

> Healthcare worker education, clarifying responsibilities

Note. Hospitals were free to design how they delivered the intervention

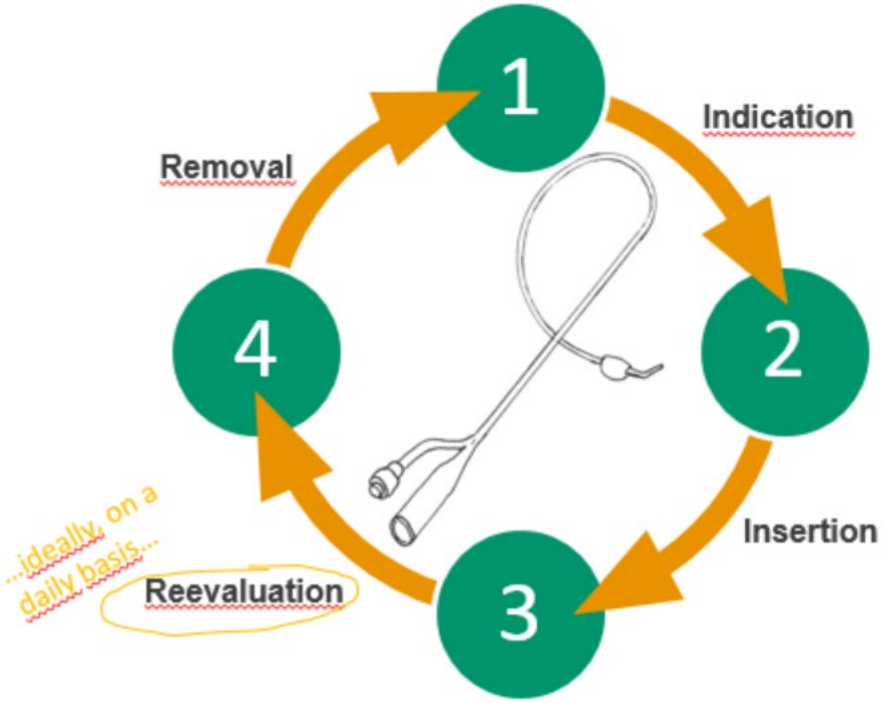
Intervention bundle

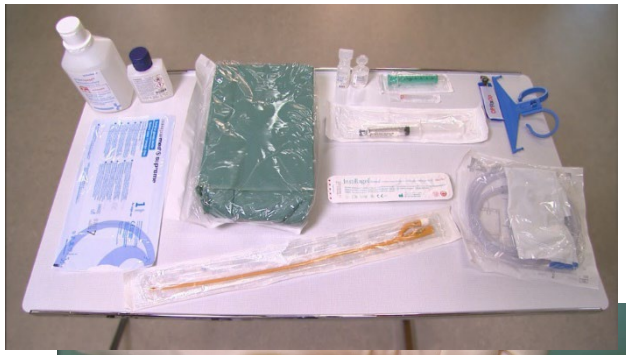
Indikationsliste
progress! Sicherheit bei Blasenkathetern

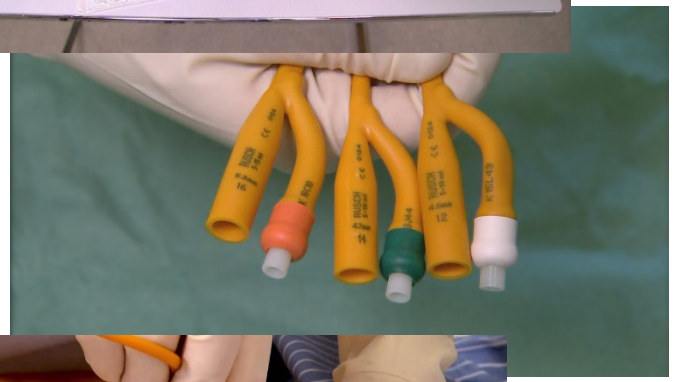
BLASEN-KATHETER

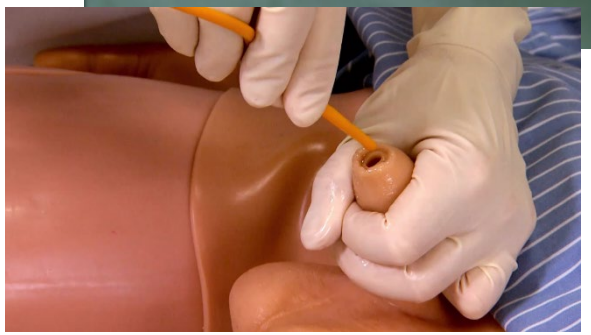
INDIKATIONEN	
Harnverhalt	• akuter Harnverhalt • symptomatische chronische Ausflussobstruktion PLUS > 300 ml Restharn
Urinmonitoring/ Bilanzierung	• in regelmässigen kurzen Intervallen PLUS direkte therapeutische Konsequenzen aus der Bilanzierung
Operation	• Operationsdauer > 4 h • perioperativ: aus operationstechnischen Gründen • Urogenitalchirurgie und/oder Beckenbodenchirurgie • epidurale/peridurale Anästhesie/Analgesie
Dekubitalulzera PLUS Inkontinenz	• Dekubitus Grad III oder IV oder Hauttransplantate sacral/perineal PLUS Inkontinenz*
Prolongierte Immobilisation	• aus medizinischen Gründen*, insbesondere zur Schmerzreduktion
Palliation PLUS Komfort	• terminal-palliative Situation PLUS Störung der Blasenfunktion PLUS/ODER Schwierigkeit einer normalen Miktion* • bei hohem Leidensdruck PLUS auf Wunsch des informierten Patienten

** Nach Ausschöpfung von Alternativmethoden zur kontrollierten Urinableitung*









Developed by an interdisciplinary expert panel

Ann Arbor criteria for appropriate use

SUPPLEMENT

Criteria for Appropriate Urinary Catheter Use in Hospitalized Medical Patients

Table 2. Guide for Foley Catheter Use in Hospitalized Medical Patients*

Appropriate indications
Acute urinary retention without bladder outlet obstruction *Example: medication-related urinary retention*
Acute urinary retention with bladder outlet obstruction due to noninfectious, nontraumatic diagnosis *Example: exacerbation of benign prostatic hyperplasia* *Caution: consider urology consultation for catheter type and/or placement for conditions, such as acute prostatitis and urethral trauma*
Chronic urinary retention with bladder outlet obstruction†
Stage III or IV or unstageable pressure ulcers or similarly severe wounds of other types that cannot be kept clear of urinary incontinence despite wound care and other urinary management strategies‡
Urinary incontinence in patients for whom nurses find it difficult to provide skin care despite other urinary management strategies‡ and available resources, such as lift teams and mechanical lift devices *Examples: turning causes hemodynamic or respiratory instability, strict prolonged immobility (such as in unstable spine or pelvic fractures), strict temporary immobility after a procedure (such as after vascular catheterization), or excess weight (>300 lb) from severe edema or obesity*
Hourly measurement of urine volume required to provide treatment *Examples: management of hemodynamic instability, hourly titration of fluids, drips (e.g., vasopressors, inotropes), or life-supportive therapy*
Daily (not hourly) measurement of urine volume that is required to provide treatment and cannot be assessed by other volume§ and urine collection strategies‖ *Examples: acute renal failure work-up, or acute IV or oral diuretic management, IV fluid management in respiratory or heart failure*
Single 24-h urine sample for diagnostic test that cannot be obtained by other urine collection strategies‖
Reduce *acute*, severe pain with movement when other urine management strategies are difficult‡ *Example: acute unrepaired fracture*
Improvement in comfort when urine collection by catheter addresses patient and family goals in a dying patient
Management of gross hematuria with blood clots in urine
Clinical condition for which ISC or external catheter would be appropriate but placement by experienced nurse or physician was difficult or patient for whom bladder emptying was inadequate with nonindwelling strategies during this admission

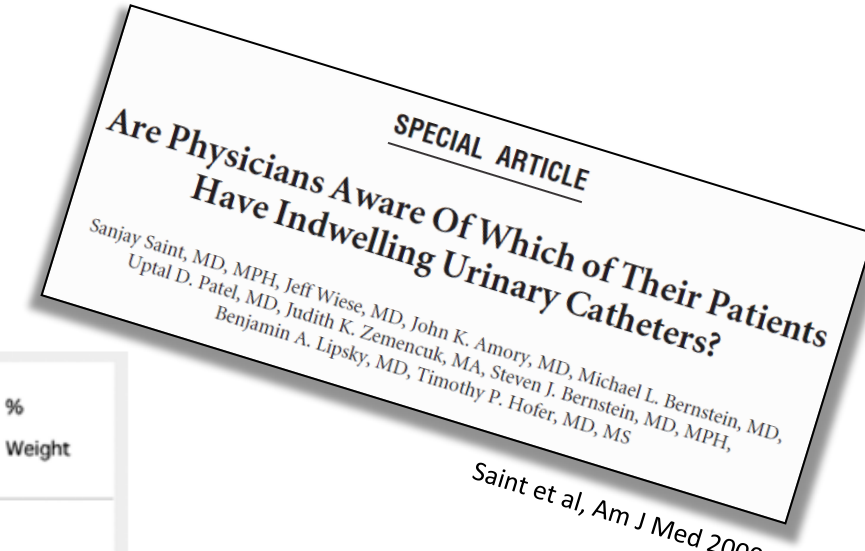
Meddings et al, Ann Arbor criteria for appropriate urinary catheter use in hospitalized medical patients, Ann Intern Med 2015.

Houdini criteria for urinary catheterization

- ✓ Gross hematuria
- ✓ Urinary obstruction
- ✓ Urologic surgery
- ✓ Open sacral decubitus ulcers in incontinent patients
- ✓ Need for tracking ins & outs (I&O) for instability
- ✓ “no code”/comfort care/hospice care
- ✓ immobility due to physical constraints

Trovillion et al, SHEA 2011, Dallas (abstract #592)

Reminders & stop orders


SPECIAL ARTICLE

Are Physicians Aware Of Which of Their Patients Have Indwelling Urinary Catheters?

Sanjay Saint, MD, MPH, Jeff Wiese, MD, John K. Amory, MD, Michael L. Bernstein, MD, Uptal D. Patel, MD, Judith K. Zemencuk, MA, Steven J. Bernstein, MD, MPH, Benjamin A. Lipsky, MD, Timothy P. Hofer, MD, MS

Saint et al, Am J Med 2000

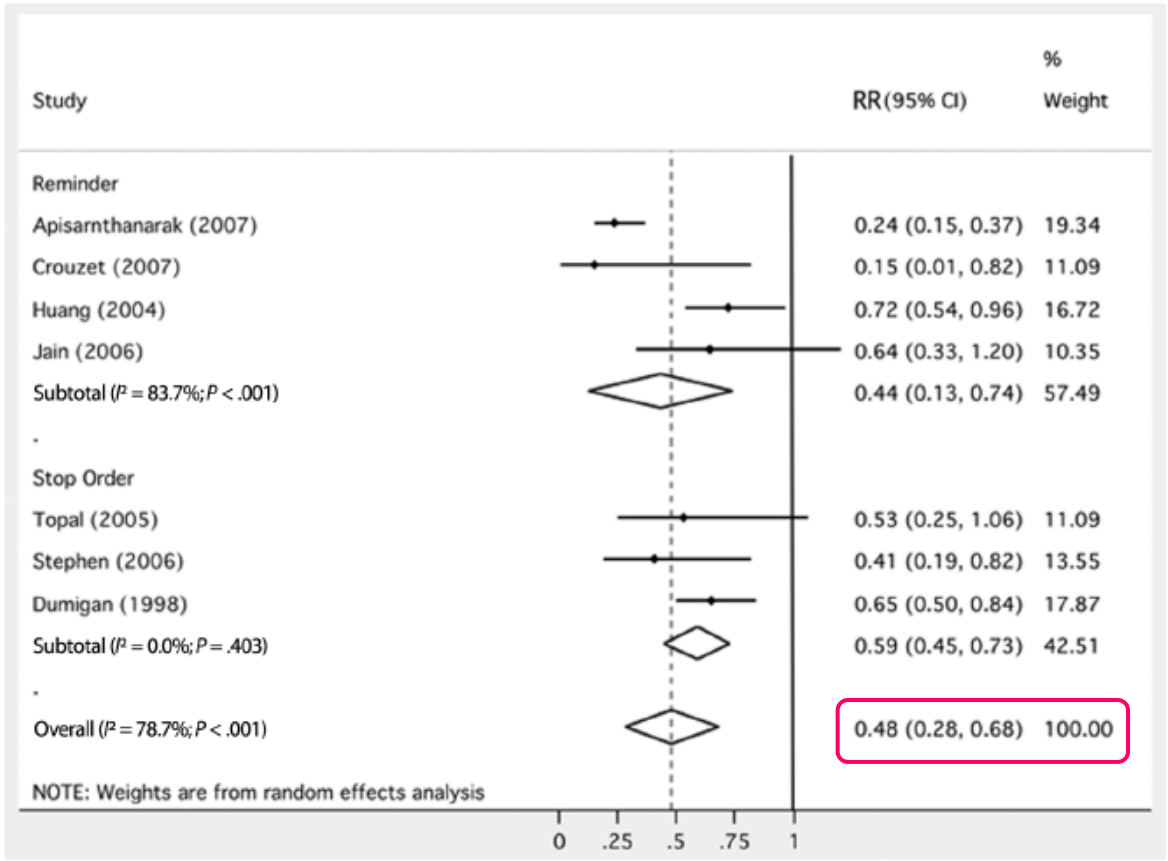


Figure 3. Meta-analysis of rate ratios (RRs) for catheter-associated urinary tract infection (CAUTI) episodes per 1000 catheter-days, for intervention versus control groups. CI, confidence interval.

(Re-catheterization rates similar across groups)

Meddings et al, CID 2010.

Setting up the surveillance

- 2 x 3 months:
  - August until October 2016 (baseline)
  - August until October 2017 (post-intervention)
- Data, captured by CTU Bern, on:
  - **Catheter utilization**
  - **Infectious complications** (symptomatic CAUTI*)
  - **Non-infectious complications**
  - Process variables:
    - Indicated catheter
    - Reevaluation of the indication
- Sample size calculation: 17,048 patients overall required to detect a 10% relative reduction in utilization

*catheter-associated urinary tract infections, definition according to NHSN

Definitions

CAUTI (NHSN, CDC)

- Catheter > 2 calendar days in place, and – if removed – removal within past 2 calendar days
- Urine culture
  - max. 2 different pathogens
  - at least 1 pathogen with ≥ 10^5 CFU/ml
- Clinical symptoms (at least one)
  - Fever > 38°C (ear)
  - Suprapubic tenderness
  - Flank pain/tenderness
  - Frequency/urgency (if catheter removed)
  - Dysuria (if catheter removed)

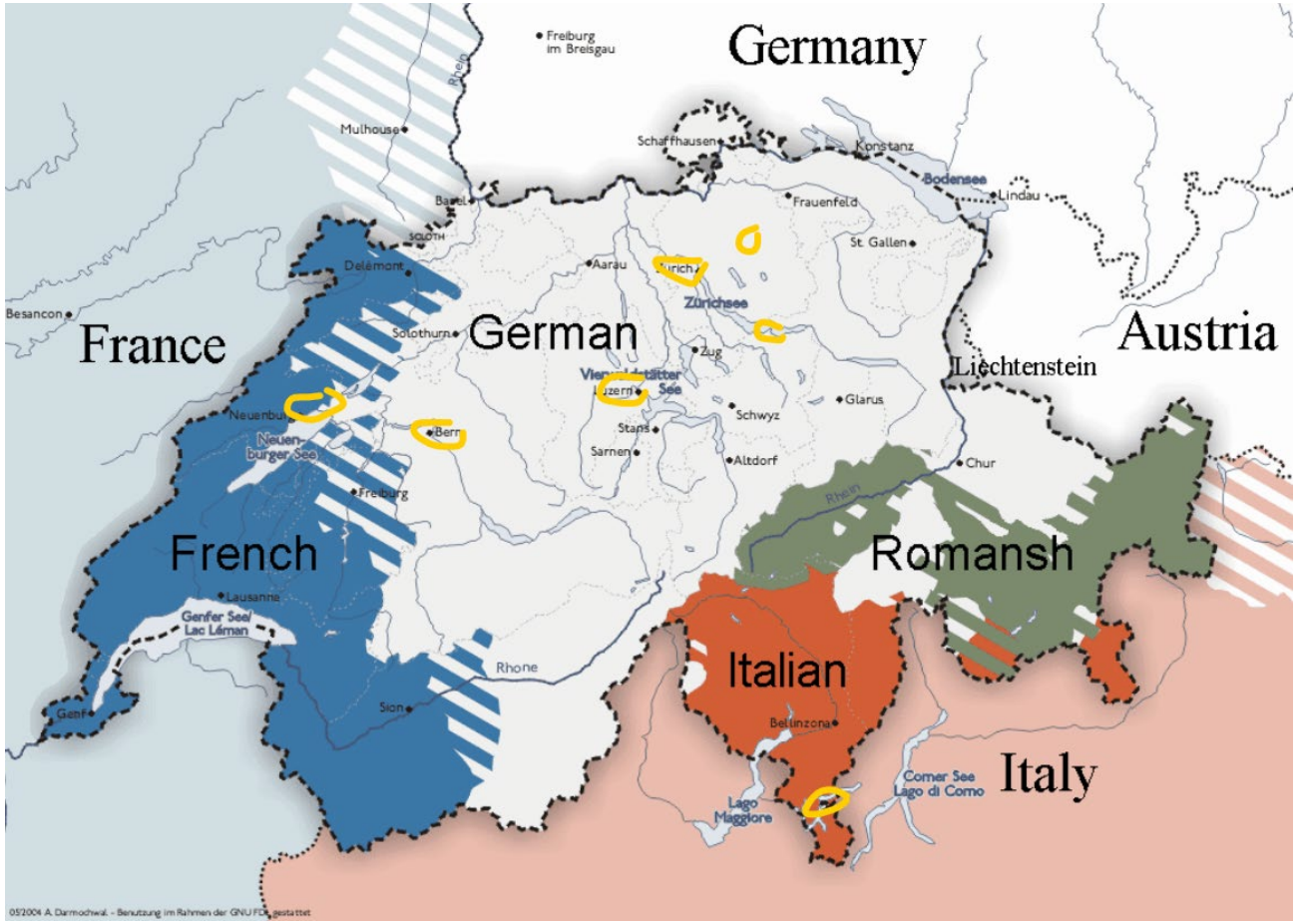
Non-infectious complications

- Urethral bleeding = frank hemorrhage from the urogenital tract
- Gross hematuria = blood-tinged urine
- Paraphimosis = constriction of the prepuce
- Catheter obstruction = absence of urine flow
- Incorrect positioning = need to reposition a recently placed catheter
- Unintentional catheter removal = removal not ordered by the medical team
- Catheter reinsertion = Reinsertion required within 24h of removing a first catheter

Aaronson et al, J Urol 2011.

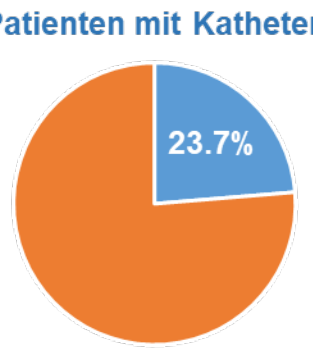
Fair representation in a multilingual country

- 7 pilot hospitals
- Rural/regional/academic
- 3 language areas



Catheter utilization

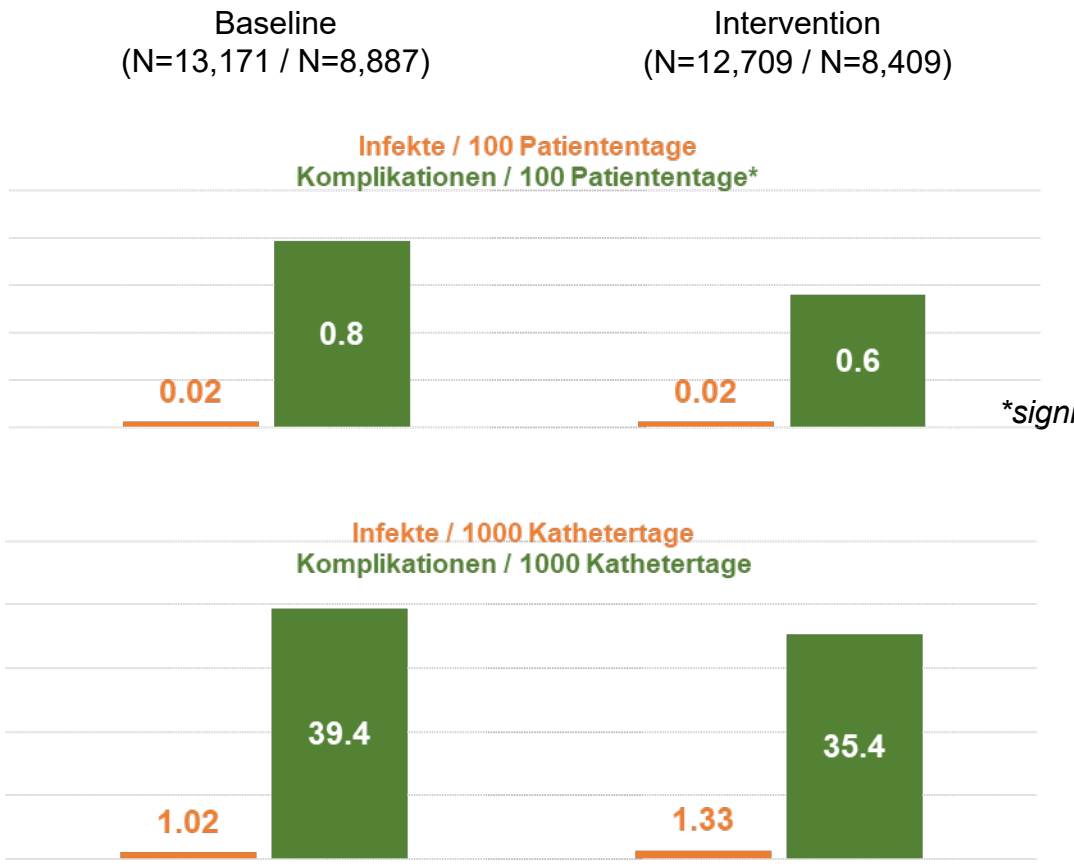
Baseline (N=13,171)



Intervention (N=12,709)

**significant change (p = 0.001)*

Complications, infectious and non-infectious



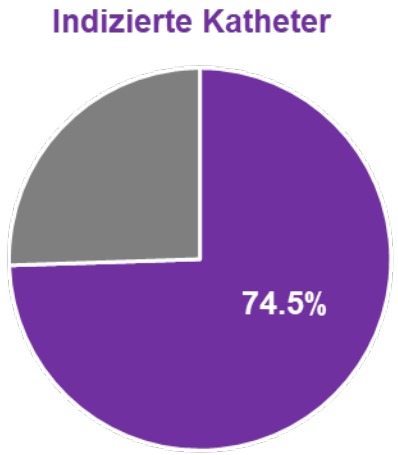
*significant change ($p < 0.001$)

Symptomatic CAUTI
Baseline: n=17
Intervention: n=16

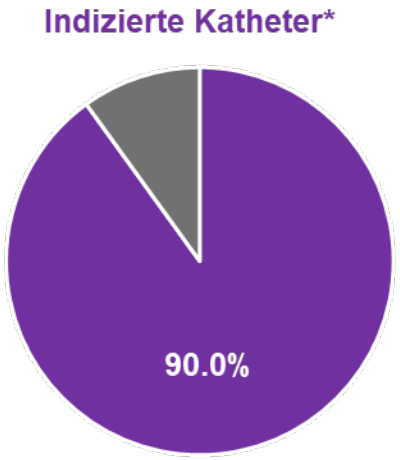
Non-infectious complications
(Data from 6 pilot hospitals)
Baseline: n=533
Intervention: n=337

Indicated catheters

Baseline (n=2,666)



Intervention (n=2,237)

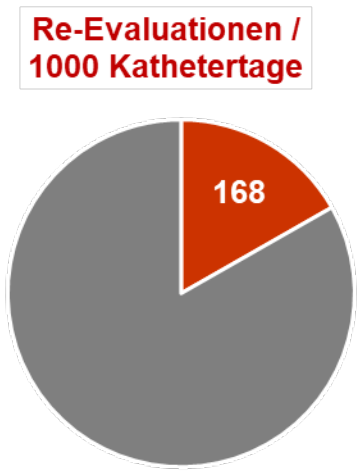


**significant change ($p < 0.001$)*

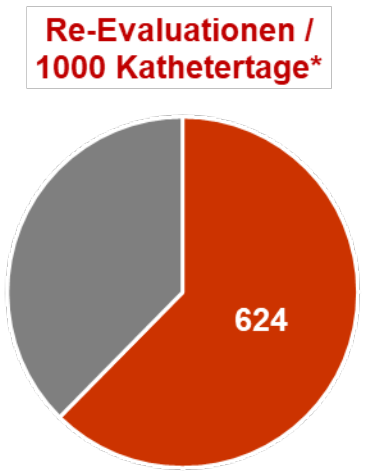
Data from 6 pilot hospitals

Reevaluation of the indication

Baseline (N=5,339)



Intervention (N=5,143)



**significant change ($p < 0.001$)*

Data from 4 pilot hospitals

Impact of an evidence-based intervention on urinary catheter utilization, associated process indicators, and infectious and non-infectious outcomes

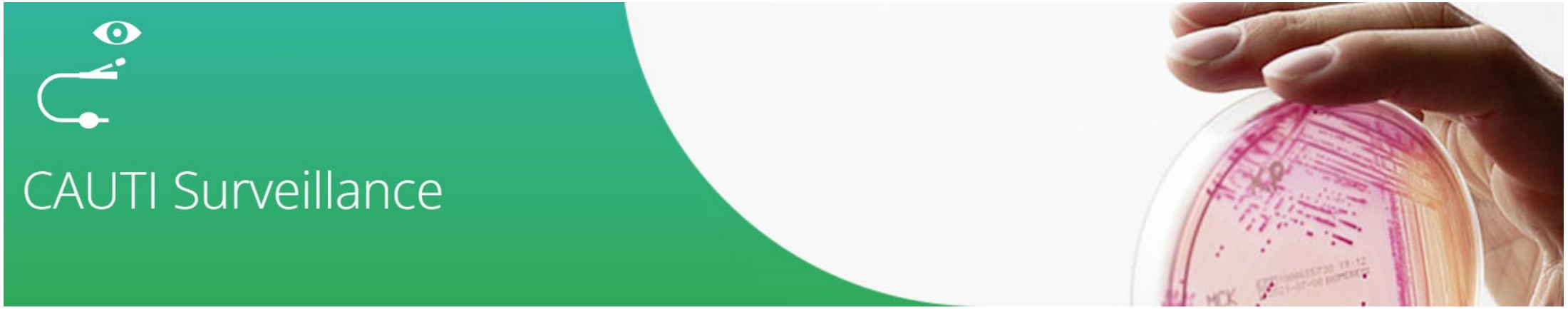
A. Schweiger [a,b,c], S.P. Kuster [a,d], J. Maag [a], S. Züllig [e], S. Bertschy [f], E. Bortolin [g], G. John [h,i], H. Sax [a,d], A. Limacher [j], A. Atkinson [k], D. Schwappach [e,l], J. Marschall [a,k,*]

[a] *Swissnoso, National Centre for Infection Control, Bern, Switzerland*

Journal of Hospital Infection 2020

- First intervention study to tackle both CAUTI and non-infectious complications, but no impact on CAUTI
- Basis for developing national CAUTI surveillance
- No explicit implementation indicators (but process indicators)

After the pilot study comes the…



Home page / modules / CAUTI Surveillance / About CAUTI Surveillance / The module

About CAUTI Surveillance
- The module
- organization
- Participant

material

training courses

support

The module

Catheter-associated urinary tract infections (CAUTI) are among the most common healthcare-associated infections. They are associated with increased morbidity and mortality, increased healthcare costs, and prolonged hospital stays. Epidemiological surveillance is a key component for the prevention, control and response to CAUTI.

For data entry →

news

09/12/2022
CAUTI Surveillance and CAUTI Intervention: An information event on the CAUTI Surveillance

www.swissnoso.ch

Rolling out (voluntary) CAUTI surveillance and intervention

Surveillance started 1/1/2022

n=20 hospitals

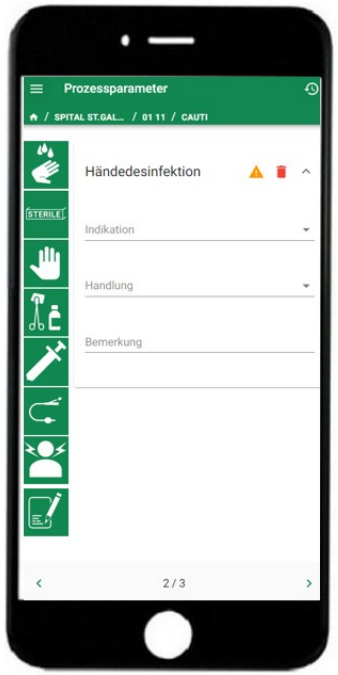
Intervention started 4/1/2023

n=3 hospitals

(Train-the-trainer workshop)

Intervention tools

Intervention manual
Materials: Indication list, pocket card, eye catcher, training video
Application (“CCM-CAUTI”) for observation of catheter insertion
Train-the-trainer workshops, group coachings

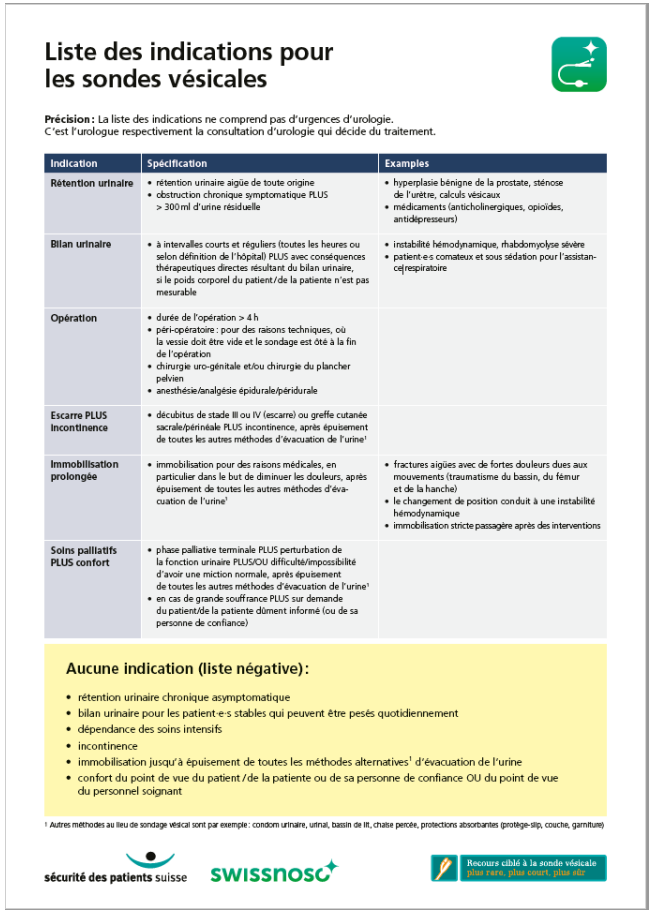


app CCM-CAUTI

eye catcher

pocket card

training video



indication list

Intervention tools now accompanied by “implementation indicators”

CAUTI Intervention – Erfassungsformular Implementierungsindikatoren (Version 1.1)

Einbezogene Organisationseinheiten (OE) /Abteilungen:

Einbezogene Organisationseinheiten gemäss Fachgebietscodes der ECDC:

☐ Chirurgie (SUR) ☐ Gyn./Geburtshilfe (G/O) ☐ Pädiatrie (PED)
☐ Medizin (MED) ☐ Intensivmedizin (ICU) ☐ Neonatologie (NEO)

Implementierungsindikatoren:

Intervention	**Indikationsliste**		**Re-Evaluation**		**Schulung**	**Beobachtung (CCM CAUTI)**	
Indikator	**F1**	**P1**	**F2**	**P2**	**F3**	**F4**	**P4**
Messziel	Ist die Indikationsliste sichtbar (physische Liste) bzw. leicht zugänglich (digitale Liste)?	Wie hoch ist der Anteil eingelegter Katheter mit dokumentierter Indikation gemäss Indikationsliste?	Wird die Notwendigkeit des Katheters täglich während der Visite re-evaluiert?	Wie hoch ist der Anteil dokumentierter Re-Evaluationen?	Sind alle relevanten Mitarbeitenden geschult?	Wird die Kathetereinlage regelmässig mit CCM-CAUTI beobachtet?	Wie hoch ist der Anteil korrekt eingelegter Katheter bei den Beobachtungen mit CCM-CAUTI?
Messzeitpunkt/-periode							
Zähler	Anzahl Orte, an denen die Indikationsliste zum Zeitpunkt der Messung sichtbar bzw. leicht zugänglich ist:	Anzahl Katheter mit dokumentierter Indikation gemäss Indikationsliste in der Messperiode:	Anzahl Re-Evaluationen auf der Visite bei Katheter-Patientinnen/Patienten in der Messperiode:	Anzahl dokumentierte Re-Evaluationen in der Messperiode:	Anzahl Mitarbeitende, die zum Zeitpunkt der Messung geschult sind:	Anzahl beobachtete Kathetereinlagen in der Messperiode:	Anzahl beobachtete fehlerfreie Kathetereinlagen in der Messperiode:
Nenner	Anzahl vorab definierte und bei der Messung überprüfte Orte insgesamt:	Anzahl eingelegte Katheter in der Messperiode:	Anzahl beobachtete Visiten bei Katheter-Patientinnen/ -Patienten in der Messperiode:	Anzahl Kathetertage in der Messperiode:	Anzahl Mitarbeitende, die zum Zeitpunkt der Messung Katheter einlegen dürfen:	Mindestanzahl Beobachtungen in der Messperiode:	Anzahl beobachtete Kathetereinlagen in der Messperiode:
					2	3	
Indikatorwert	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0%	0%	#DIV/0!
GOI Score	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	1	1	#DIV/0!

F: Fidelity (Umsetzungstreue), P: Penetration (Durchdringung)

Hinweise zum Ausfüllen des Tabellenblatts:
Bitte füllen Sie die gelben Felder aus. Die grünen Felder stellen die Indikatoren und die GOI Scores dar und sind mit Formeln hinterlegt, d.h. sie werden automatisch aus den eingefügten Werten berechnet.
Bitte nennen Sie in der Zeile 2 die in die Intervention einbezogenen Organisationseinheiten/Abteilungen und kreuzen Sie in der Zeile 3 die einbezogenen Organisationseinheiten gemäss ECDC Fachgebietscodes an.
Bitte geben Sie in der Zeile 8 pro Indikator den konkreten Zeitpunkt der Messung (F1, F3) bzw. die Messperiode (P1, F2, P2, F4, P4) an.

Implementation questions

Is the indication list visible (physical list) or readily available (digital list)?	F
What percentage of inserted catheters have a documented indication?	P
Is the necessity of ongoing catheterization being evaluated on a daily basis?	F
What is the percentage of documented reevaluations?	P
Are all HCP who insert catheters trained in doing so?	F
Is the catheter insertion observed with the IT app on a regular basis?	F
What is the percentage of correctly placed catheters when observed?	P

Aspects covered: Fidelity, penetration

Implementation Outcome	Examples of Synonym(s)/Antonym(s)
Acceptability	Agreeable, acceptable, usability
Adoption	Uptake, utilization, initial implementation, intention to try, de-implementation, de-adoption, de-institutionalization
Appropriateness	Fit, usefulness
Feasibility	Utility
Fidelity	Adherence, integrity, adaptation
Implementation cost	Marginal cost, cost-effectiveness, cost-benefit, incremental cost, cost impact
Penetration	Spread, service access, saturation, reach
Sustainability	Maintenance, continuation, integration, sustained use, abandonment

Burnham et al, Clin Infect Dis 2020.

Implementation indicators are a diagnostic tool - but may not tell us how to fix a problem

Implementing infection prevention practices across European hospitals: an in-depth qualitative assessment

Lauren Clack,[1,2] Walter Zingg,[2] Sanjay Saint,[3,4] Alejandra Casillas,[5] Sylvie Touveneau,[2] Fabricio da Liberdade Jantarada,[2] Ursina Willi,[1] Tjallie van der Kooi,[6] Laura J Damschroder,[3] Jane H Forman,[3] Molly Harrod,[3] Sarah Krein,[3,4] Didier Pittet,[2] Hugo Sax,[1,2] PROHIBIT Consortium

BMJ Qual Saf 2018

Three factors deemed relevant for success:

- Setting an implementation agenda
- Having the necessary (human and material) resources
- Boundary spanners, individuals who help overcome intra-institutional segregation

Conclusions

- 3-item bundle decreased urinary catheter utilization in a pilot intervention study – forming the basis for national CAUTI surveillance
- Make your study endpoint one that likely is impacted by the intervention
- A negative intervention study could be due to 1) poor choice of intervention, 2) insufficient power, or 3) poor implementation
- Design implementation indicators into your intervention study

Thank you for your attention!

swissnoso Nationales Zentrum für Infektionsprävention

INSELSPITAL UNIVERSITÄTSSPITAL BERN HÔPITAL UNIVERSITAIRE DE BERNE

patient safety switzerland
patientensicherheit schweiz
sécurité des patients suisse
sicurezza dei pazienti svizzera