

MITIGATION OF AMR: INFECTION PREVENTION AND ANTIMICROBIAL STEWARDSHIP, IMPLEMENTATION AND BEHAVIOR CHANGE

Ingrid Smith, Patient safety unit, Dept. of R&D, Haukeland University Hospital
Stig Harthug, Senior advisor, Dept. of R&D, Haukeland University Hospital/
Professor, University of Bergen



WHO ARE WE?

Stig Harthug



- Infectious disease specialist
- Professor at UiB
- PhD on outbreak of multiresistant enterococci
- Developed Department of infection control HUS 1995-2006
- Head of Patient safety 06-21
- About 80 scientific publications
- Appointed member of REK-vest

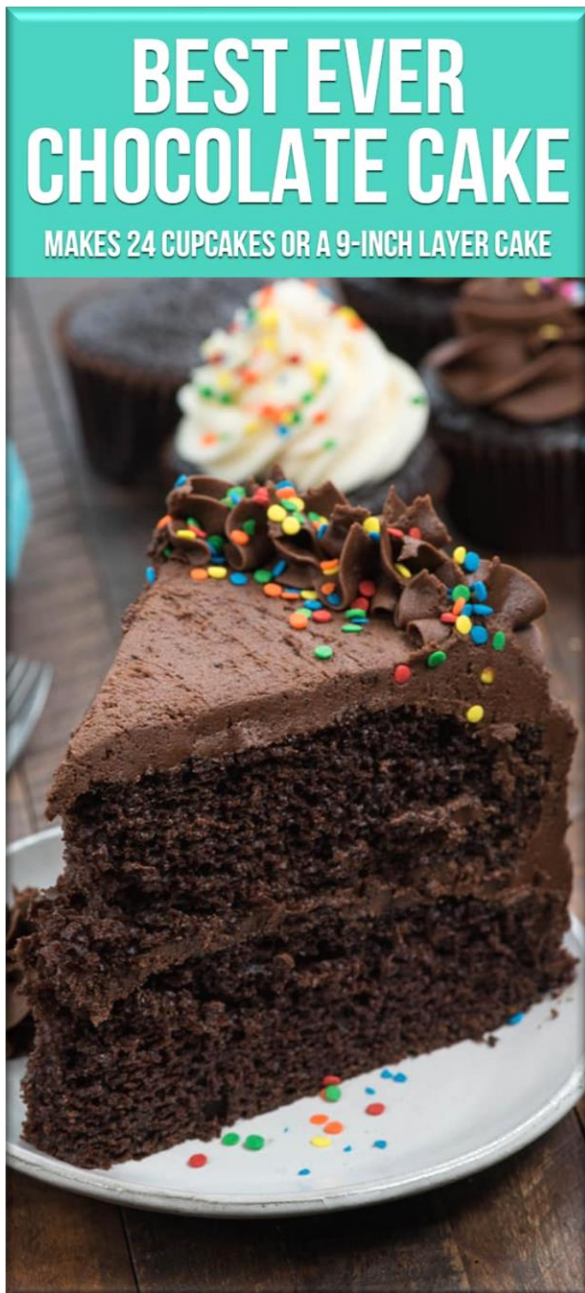
Areas of interest: Antimicrobial stewardship, implementation science, patient safety research

Ingrid Smith



- Infectious disease specialist
- MSc in epidemiology
- PhD on Meningococcal disease epidemiology
- Technical lead on AMS WHO, Geneva
- Head of Patient safety -21

Areas of interest: Antimicrobial stewardship, Implementation and behavior change, communicable disease epidemiology



Mitigation of AMR, IPC, AMS, implementation and behavior change

A good cake recipe is not enough, you must know how to make the cake

Both the WHAT and the HOW are needed to mitigate AMR:

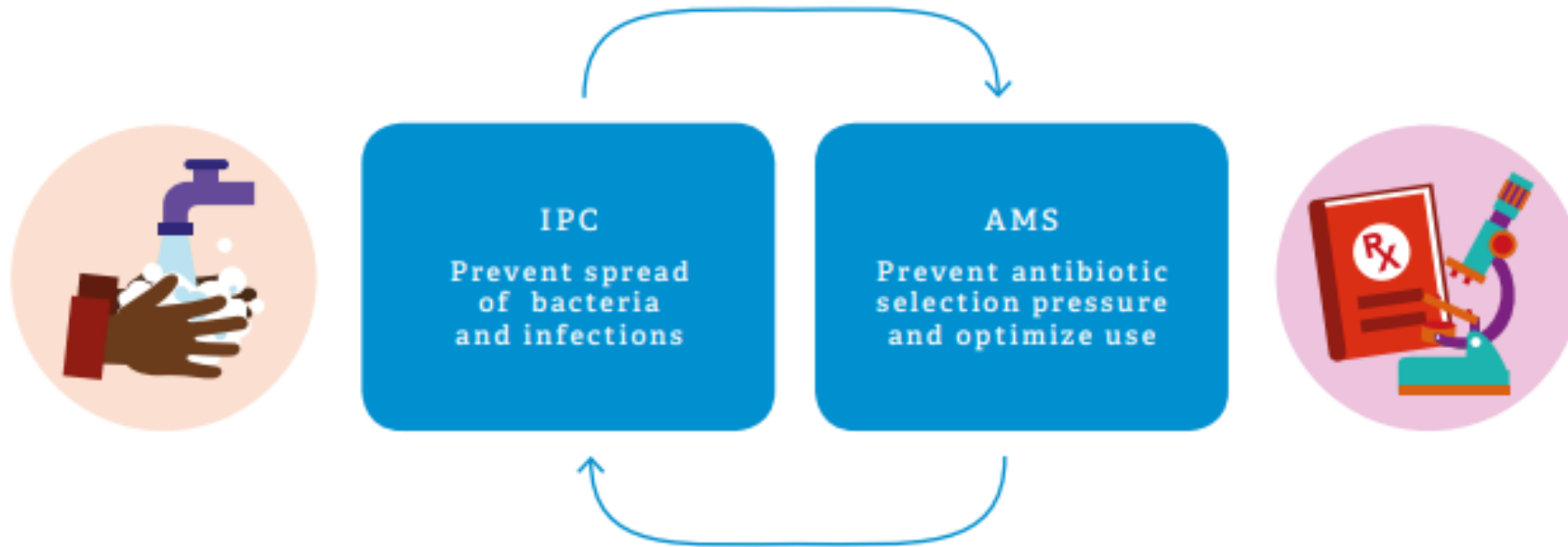
Ex. *what* is the **policy**, how is the **implementation** of the policy

Infection prevention: MASK, right use is crucial for it to be effective



ANTIBIOTIC (OR ANTIMICROBIAL) STEWARDSHIP PROGRAM (ASP)

APIC-definition: Antimicrobial stewardship are **coordinated interventions that promote the appropriate use of antimicrobials (including antibiotics), improves patient outcomes, reduces antimicrobial resistance, and thereby decreases the spread of (multidrug-resistant) organisms.**



National Advisory Unit for Antibiotic Use in Hospitals (KAS)



Nasjonal kompetansetjeneste for antibiotikabruk i spesialisthelsetjenesten

Antibiotikaresistens er et globalt helseproblem. Utvikling og spredning av resistens kan hindres ved smitteverntiltak og ved nøktern antibiotikabruk.

Hovedoppgaven for kompetansetjenesten er å støtte norske sykehus i arbeidet for ansvarlig antibiotikabruk.

SCROLL NED



NATIONAL ADVISORY UNIT FOR ANTIBIOTIC USE IN HOSPITALS (KAS)

Sponsored by Directory of Health from December 2011

- Process: a National centre for rational use of antibiotics in hospitals

Objectives

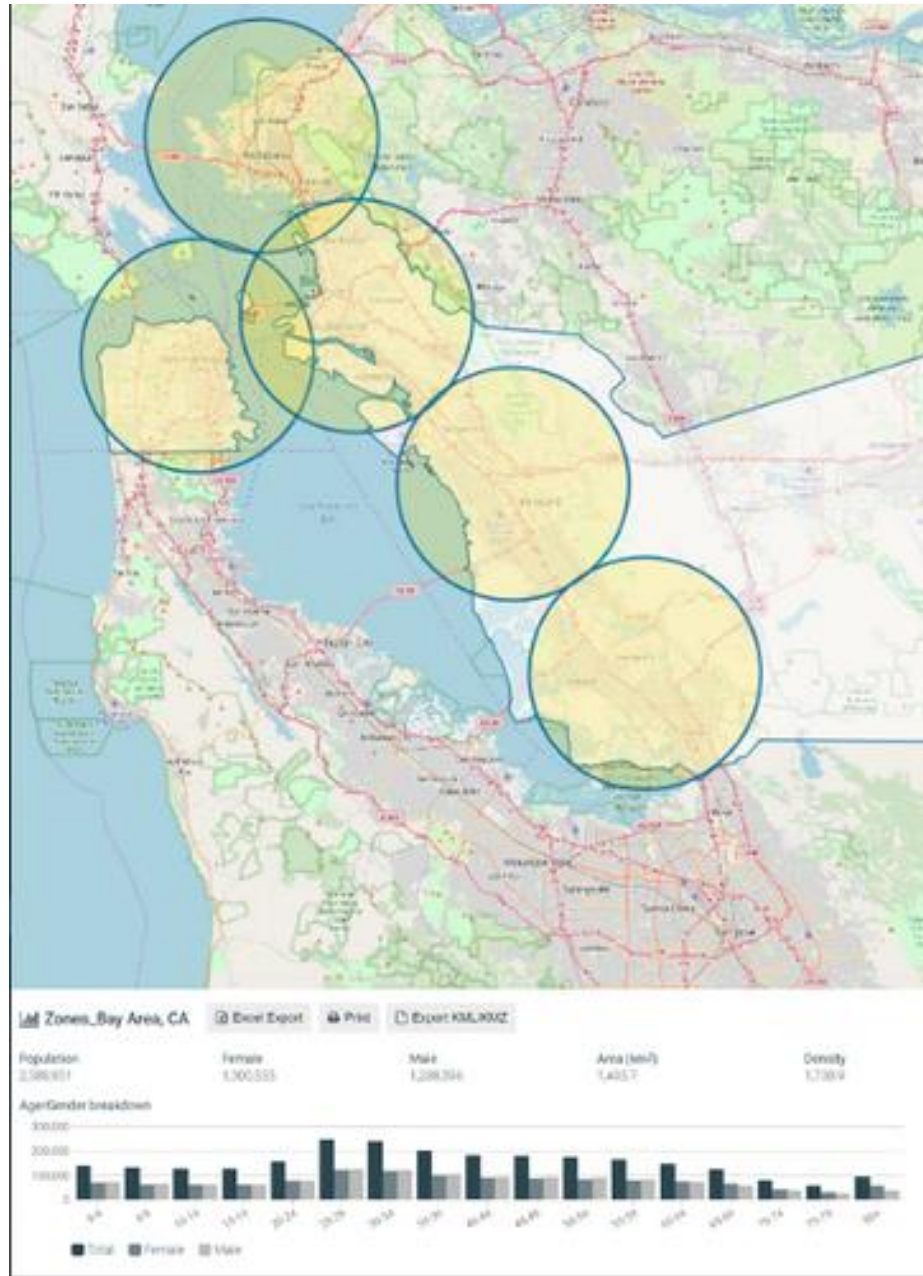
- Supporting A-teams (antimicrobial stewardship= AMS) at all Norwegian hospitals:
 - Workshops: infections, antibiotics and microbes, and AMS interventions and implementation
 - Audit and review of the implementation of AMS programmes in hospitals
- Development and maintenance of national antibiotic treatment guidelines for hospitals
- Delivering national statistics on antibiotic usage rate (AUR)
- Though not financed, research initiated on AMS related topics

GOAL OF OUR RESEARCH

Generate knowledge on how to best promote an antibiotic prescribing practice that provides

- Efficient and safe healthcare
- Good treatment results
- Does not promote resistance

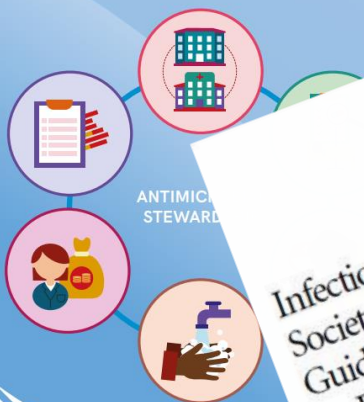




Before implementing interventions it may be wise to get an overview of the landscape

Research at KAS:

An understanding of key determinants (enablers and barriers) - influence the successful design, adoption and implementation of interventions in antimicrobial stewardship programs


ANTIMICROBIAL
STEWARDSHIP

GUIDELINES

Infectious Diseases Society of America and the
Society for Healthcare Epidemiology of America
Guidelines for Developing an Institutional Program
to Enhance Antimicrobial Stewardship

Journal of
Antimicrobial
Chemotherapy

Timothy H. Dellit¹, Robert P. Owens², John F. McGowan³, et al.

J. Brennan⁴

Cochrane
Library
Cochrane Database of Systematic Reviews

Interventions to improve antibiotic prescribing practices for
hospital inpatients (Review)

Davey P, Marwick P, Charani E, McNeil K, Brown F


World Health
Organization

IMPLEMENTATION MANUAL
to support the prevention of
surgical site infections at the facility level –
**TURNING RECOMMENDATIONS
INTO PRACTICE**

(INTERIM VERSION)



Review

Antibiotic prescribing in hospitals: a social and behavioural scientific approach

Marlies E J L Hulscher, Richard P T M Grol, Jos W M van der Meer

Antibiotics have dramatically changed the prognoses of patients with severe infectious diseases over the past 50 years. However, the emergence and dissemination of resistant organisms has endangered the effectiveness of antibiotics. *Lancet Infect Dis* 2010; 10: 167-75

J Antimicrob Chemother 2012; 67 Suppl 1: i51-i63
doi:10.1093/jac/dks202

Improving the quality of antibiotic prescribing in the NHS by
developing a new Antimicrobial Stewardship Programme:
Start Smart—Then Focus

Diane Ashiru-Oredope¹, Mike Sharland², Esmita Charani³, Clodna McNulty⁴ and Jonathan Cooke^{3,5*} on behalf of
ARHAI Antimicrobial Stewardship Group[†]

Contents lists available at SciVerse ScienceDirect
locate/ijantimicag

International Journal of Antimicrobial Agents
journal homepage: <http://www.elsevier.com/locate/ijantimicag>



Review

Understanding physician antibiotic prescribing
qualitative studies
António Teixeira Rodrigues^{a,b,*}, Fátima Roque^{a,c},
Adolfo Figueiras^{d,e}, Maria Teresa Herdeiro^{a,b,i}

KNOWLEDGE GAPS WE ADDRESS

- How are antibiotics prescribed in Norway?
- What factors facilitate a prescribing practice which does not promote antimicrobial resistance?
- What interventions are effective and how should they be implemented to best achieve their goal?
- Golden standard for rational antibiotic use – guideline
- Patient outcomes when guidelines were adhered to



Which study design provides what kind of knowledge?



Quantitative research

Data Driven

Numbers & percentages

Concrete & objective

HOW MUCH? HOW MANY?



Qualitative research

Design Thinking

Quotes & expressions

Abstract & subjective

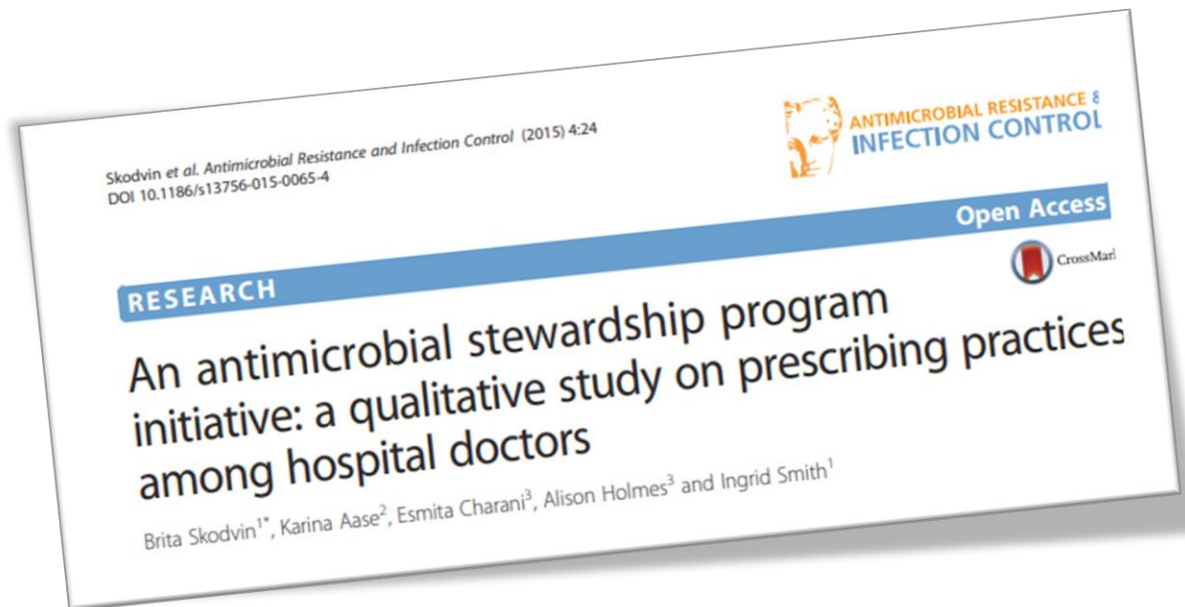
WHY? WHAT? HOW?

Factors influencing antibiotic prescribing



Brita Skodvin

PhD: *Addressing the threat of AMR in Norway: optimising antibiotic prescribing and microbiology testing in hospitals*



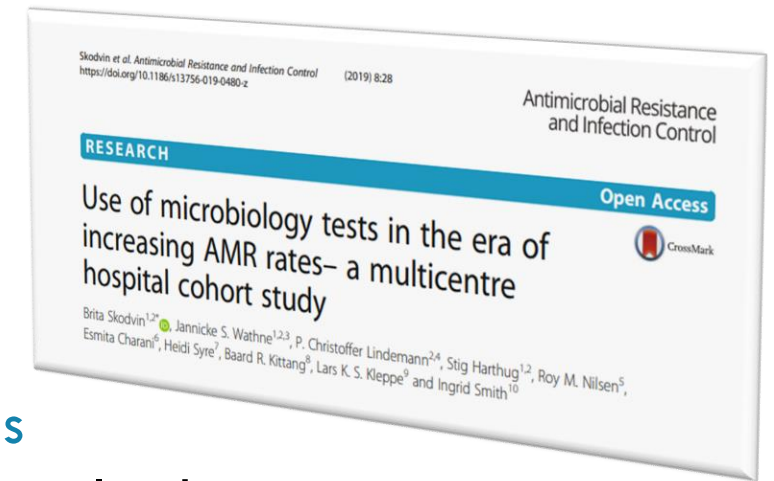
Material and methods

Explorative qualitative design with individual interviews with 15 doctors from 13 hospitals

Results

- The guideline
- Specialists in infectious diseases
- The patient
- Microbiology tests

What about microbiology tests?



Material and methods

Multicentre observational cohort

Medical wards, 3 hospitals, Western-Norway, 1731 patients

Results

- Substantial additional testing: LRTI patients had urine cultures taken
- One hospital: 18% of patient admissions had applicable test results, only 9% test results used to inform prescription of antibiotic therapy

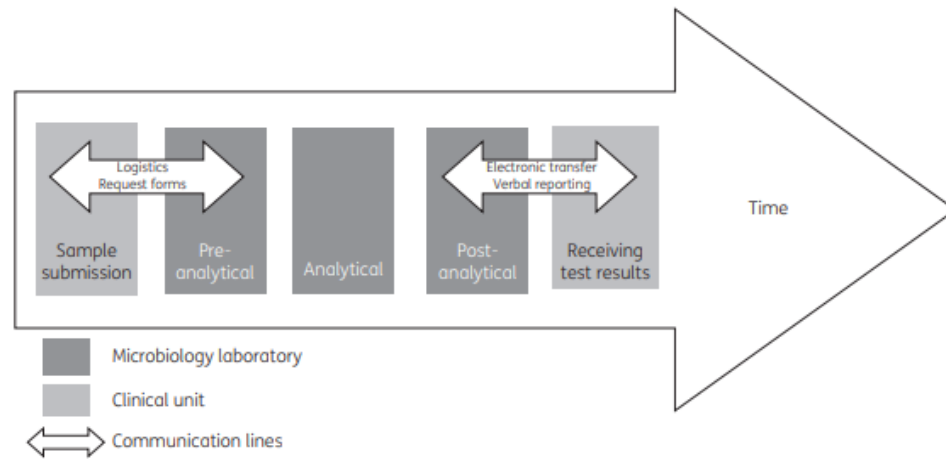


Figure 1. Communication between microbiology laboratories and clinical units on specimen processing and test results.

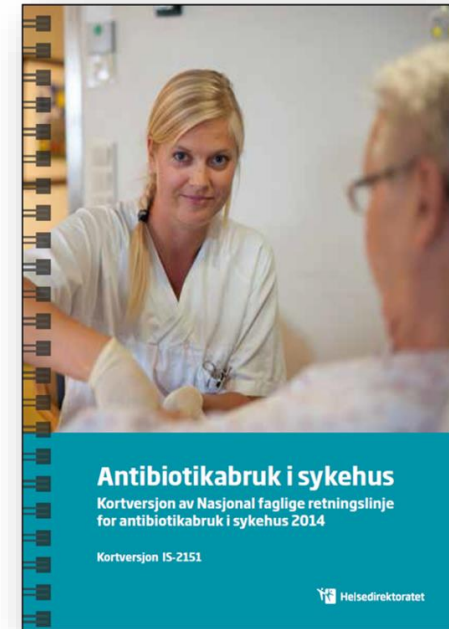
Guideline og targets for interventions

Jannicke Slettli Wathne

PhD: *Bridging the evidence gap for implementing antibiotic stewardship in Norway: Interventions, process measures and patient outcomes related to antibiotic prescribing in hospitals*

Material and methods

- Multicentre observational cohort study
- Six medical wards at three hospitals in Western-Norway
- Data collected from patient records
- 1756 patients





RESEARCH

The association between adherence to national antibiotic guidelines and mortality, readmission and length of stay in hospital inpatients: results from a Norwegian multicentre, observational cohort study

Jannicke Slettli Wathne^{1,2,3*}, Stig Harthug^{1,2}, Lars Kåre Selland Kleppe⁴, Hege Salvesen Blix⁵, Roy M. Nilsen⁶, Esmita Charani⁷ and Inarid Smith^{8*}



Identifying targets for antibiotic stewardship interventions through analysis of the antibiotic prescribing process in hospitals - a multicentre observational cohort study

Jannicke Slettli Wathne^{1,2,3*}, Brita Skodvin^{1,2}, Esmita Charani⁴, Stig Harthug^{1,2}, Hege Salvesen Blix^{5,6}, Roy M. Nilsen⁷, Lars Kåre Selland Kleppe⁸, Marta Vukovic⁹ and Inarid Smith^{10*}

Results guideline

Treatment adherent to the national antibiotic guideline:

- 30-day fatality lower than if GL not adhered to
- Trend - shorter length of stay than if nor adhered to
- 30 day re-admission: independent of adherence to GL

Results Targets for interventions

Adherence to GL increased use of WHO Access antibiotics

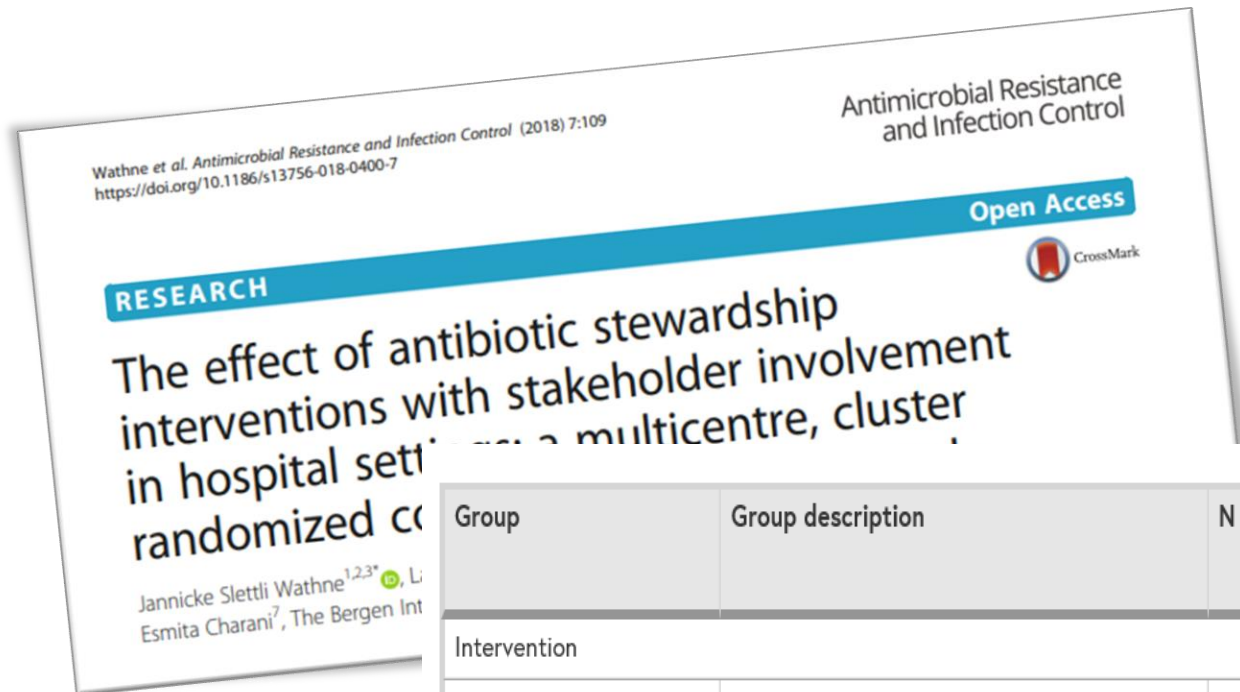
Treatment initiated in Emergency room (> 80% prescribed)

Length of treatment (same length independent of diagnoses)

Understanding culture/context drives of antibiotic prescribing (LTCFs and different wards)

The association between interventions and behavior change

Percentage of adherence to antibiotic guidelines in periods before and after interventions were implemented



- Context is crucial
- Identification of specific goals/ that they are SMART

Group	Group description	N Before/after	Period		Absolute Change %	P for change ^a	P for Interaction ^b
			Before n (%)	After n (%)			
Intervention							
Control	All specialties	350/169	174 (50)	84 (50)	0	0.998	
Interventions	All specialties	929/354	556 (60)	234 (66)	6	0.04	0.252
Academic detailing	All specialties	451/172	265 (59)	111 (65)	6	0.188	0.353
Audit with feedback	Infectious diseases + Pulmonary medicine	478/182	291 (61)	123 (68)	7	0.111	0.265
Specialty							
Pulmonary medicine	Both interventions	427/162	249 (58)	116 (72)	14	0.003	0.034
Infectious diseases	Both interventions	424/153	268 (63)	99 (65)	2	0.741	0.857
Gastroenterology	Academic detailing	78/39	39 (50)	19 (49)	-1	0.896	0.556



Imperial College
London

Tackling Antimicrobial Resistance: A Social Science Approach



MAJOR ARTICLE

Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of “Prescribing Etiquette”

E. Charani,¹ E. Castro-Sanchez,¹ N. Sevdalis,^{2,3} Y. Kyratsis,¹ L. Drumright,¹ N. Shah,¹ and A. Holmes¹

¹The National Centre for Infection Prevention and Management, Hammersmith Hospital; and ²Department of Surgery and Cancer, and ³Imperial Centre for Patient Safety and Service Quality, St Mary's Hospital, Imperial College London, United Kingdom

J Antimicrob Chemother 2018; 73: 2613–2624
doi:10.1093/jac/dky222 Advance Access publication 17 July 2018

Driving sustainable change in antimicrobial prescribing practice: how can social and behavioural sciences help?

Fabiana Lorencatto^{1*}, Esmita Charani², Nick Sevdalis³, Carolyn Tarrant⁴ and Peter Davey⁵

Journal of
Antimicrobial
Chemotherapy

MAJOR ARTICLE

Behavior Change Strategies to Influence Antimicrobial Prescribing in Acute Care: A Systematic Review

Esmita Charani,¹ Rachel Edwards,¹ Nick Sevdalis,² Banos Alexandrou,³ Eleanor Sibley,⁴ David Mullett,⁴
Bryony Dean Franklin,^{5*} and Alison Holmes¹

¹The National Centre for Infection Prevention and Management, ²Department of Surgery and Cancer and Centre for Patient Safety and Service Quality, Imperial College London, ³Independent Consultant, ⁴Dr Foster Intelligence, ⁵Centre for Medication Safety and Service Quality, Imperial College Healthcare National Health Service Trust, and ⁶The School of Pharmacy, University of London, Pharmacy Department, Charing Cross Hospital, London.

Results:

ABP is governed by a set of cultural rules, performed in an environment where behavior of clinical leaders/seniors influence practice of junior doctors.

Senior doctors consider themselves exempt from following policy and practice, where decision making relies more on knowledge and experience than formal policy.

Prescribers identify with their clinical groups and adjust ABP to the prevailing practice. These cultural rules demonstrate the existence of a “**prescribing etiquette**” environment where professional **hierarchy and clinical groups** are **key determinants of APB**

RESEARCH

Open Access

Antibiotic prescribing in general medical and surgical specialties: a prospective cohort study

E. Charani^{1*}, E. de Barra², T. M. Rawson¹, D. Gill³, M. Gilchrist⁴, N. R. Naylor¹ and A. H. Holmes¹



Antibiotics in surgery are

- 1) prescribed more frequently ($p=0.001$);
- 2) for longer ($p=0.016$);
- 3) more likely to be escalated ($p=0.004$);
- 4) less likely to be compliant with local policy ($p<0.001$) than medicine

RESEARCH ARTICLE

Investigating the cultural and contextual determinants of antimicrobial stewardship programmes across low-, middle- and high-income countries—A qualitative study

Esmita Charani^{1*}, Ingrid Smith², Brita Skodvin³, Anne Perozziello⁴, Jean-Christophe Lucet^{4,5}, François-Xavier Lescure^{4,5}, Gabriel Birgand¹, Armel Poda⁶, Raheelah Ahmad¹, Sanjeev Singh⁷, Allison Helen Holmes¹

1 NIHR Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, Imperial College London, London, United Kingdom, **2** Department of Essential medicines and Health Products, World Health Organization, Geneva, Switzerland, **3** Norwegian advisory unit for Antibiotic use in Hospitals, Haukeland University Hospital, Bergen, Norway, **4** Assistance Publique-Hôpitaux de Paris (AP-HP), Bichat-Claude Bernard Hospital, Infection Control Unit, Paris, France, **5** IAME, UMR 1137, INSERM, Université Paris Diderot, Sorbonne Paris Cité, Paris, France, **6** School of Medicine, University Hospital Soura Sanou, University of Bobo Dioulasso, Bobo Dioulasso, Burkina Faso, **7** Department of Medicine, Amrita Institute of Medical Sciences, Amrita University, Kerala, India



1. State support for ASP was perceived as essential in countries where it is lacking (India, Burkina Faso), and perceived as a barrier (England, France) where it was present.
2. Professional boundaries is a key cultural determinant dictating interdisciplinary involvement.
3. Doctors recognised as leaders in ASP.

PHD ARNE MEHL NTNU 2017



Bloodstream infection at Levanger Hospital, Mid Norway 2002-2013.

- Two of the papers comprises epidemiology, antibiotic resistance and antibiotic treatment
- Supporting the current treatment with penicillin and gentamicin as effective in most cases



PHD GUNNAR HUSABØ 2021



"External inspections of healthcare organizations"

- Research project sponsored by Statens Helsetilsyn
- Stepped wedge controlled analysis of 7407 hospital admissions
- Diagnostics and treatment of sepsis in 24 Norwegian EMD 2016 – 2018
- The emergency department does not always manage to carry out diagnostics of sepsis in accordance with recommended guidelines
- Many patients are given delayed start-up of treatment, which often is associated with suboptimal diagnostic work carried out

BMJ Open Effects of external inspections on sepsis detection and treatment: a stepped-wedge study with cluster-level randomisation

Gunnar Husabo ^{1,2} Roy Miodini Nilsen,³ Erik Solligård,^{4,5} Hans Kristian Flaatten,⁶ Kieran Walshe,⁷ Jan C Frich,⁸ Gunnar Tschudi Bondevik,^{2,9} Geir Sverre Braut,^{10,11} Jon Helgeland ^{1,2} Stig Harthug,^{13,14} Einar Hovlid ^{1,2,11}

To cite: Husabo G, Nilsen RM, Solligård E, et al. Effects of external inspections on sepsis detection and treatment: a stepped-wedge study with cluster-level randomisation. *BMJ Open* 2020;10:e037715. doi:10.1136/bmjopen-2020-037715

► Prepublication history and additional material for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-037715>).

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For numbered affiliations see end of article.

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ABSTRACT

Objective To evaluate the effects of external inspections on (1) hospital emergency departments' clinical processes for detecting and treating sepsis and (2) length of hospital stay and 30-day mortality.

Design Incomplete cluster-randomised stepped-wedge design using data from patient records and patient registries. We compared care processes and patient outcomes before and after the intervention using regression analysis.

Setting Nationwide inspections of sepsis care in emergency departments in Norwegian hospitals.

Participants 7407 patients presenting to hospital emergency departments with sepsis.

Intervention External inspections of sepsis detection and treatment led by a public supervisory institution.

Main outcome measures Process measures for sepsis diagnostics and treatment, length of hospital stay and 30-day all-cause mortality.

Results After the inspections, there were significant improvements in the proportions of patients examined by a physician within the time frame set in triage (OR 1.28, 95% CI 1.07 to 1.53), undergoing a complete set of vital measurements within 1 hour (OR 1.78, 95% CI 1.10 to 2.87), having lactate measured within 1 hour (OR 2.75, 95% CI 1.83 to 4.15), having an adequate observation regimen (OR 2.20, 95% CI 1.51 to 3.20) and receiving antibiotics within 1 hour (OR 2.16, 95% CI 1.83 to 2.55). There was also significant reduction in mortality and length of stay, but these findings were no longer significant when controlling for time.

Conclusions External inspections were associated with improvement of sepsis detection and treatment. These findings suggest that policy-makers and regulatory agencies should prioritise assessing the effects of their inspections and pay attention to the mechanisms by which the inspections might contribute to improve care for patients.

Trial registration NCT02747121.

INTRODUCTION

External assessment of healthcare providers is in widespread use as a policy strategy to foster improvement in the quality of care.¹

Strengths and limitations of this study

- This is the first large-scale study using a robust design to evaluate the effects of external inspections on clinical care.
- As it was not possible to design a randomised controlled study, we used a stepped-wedge design, allowing the inspections to proceed as usual while we assessed effects based on data collected by the inspectors.
- Even though we adjusted for a range of known confounders, there is a risk that unknown external factors not included in the analyses introduced bias to the effect estimates.

WHO defines assessment as an external institutional strategy and divides it into three subcategories: accreditation, certification and supervision.² According to WHO, *accreditation* generally refers to external assessment of an organisation by an accreditation body, *certification* is usually used to describe external assessment of compliance with standards published by the International Organisation for Standardisation (ISO) and *supervision* refers to an authoritative monitoring of healthcare providers' compliance with minimum standards often set by legislation.²

These assessment schemes represent heterogeneous, complex processes that consist of a set of activities that are introduced into varying organisational and regulatory contexts, and their origin and objectives can differ.³ They share an important defining element in that: "some dimensions or characteristics of a health care provider organisation and its activities are assessed or analysed against a framework of ideas, knowledge, or measures derived or developed outside that organisation".⁴ The phrase "external" also implies that the assessment is initiated and

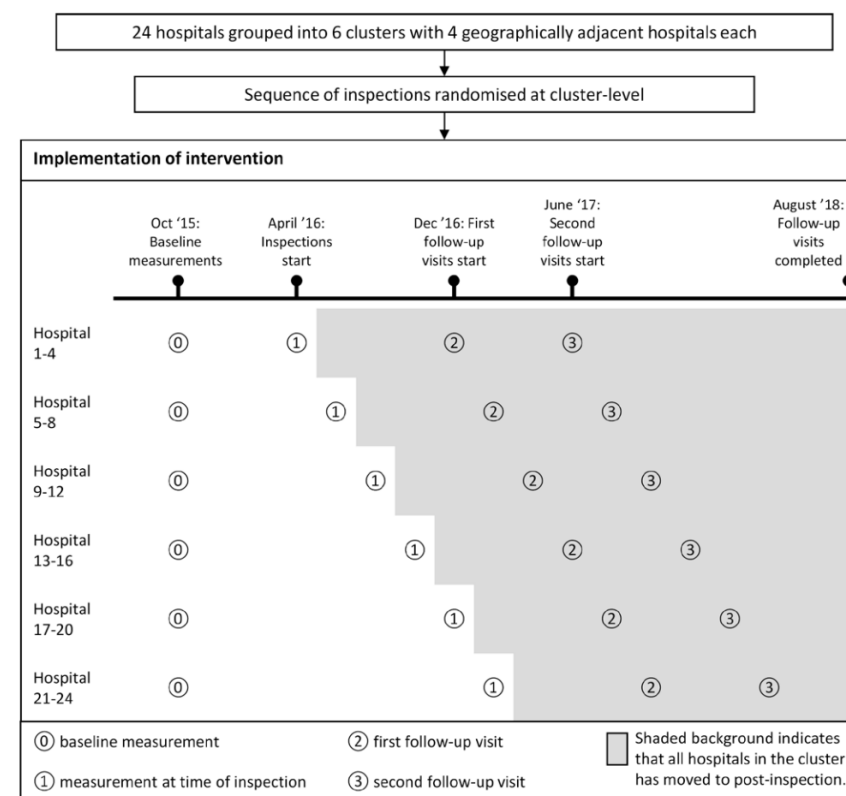


Figure 1 Trial profile.

Children

- How are antibiotics prescribed to children and how can it be improved?

Material and methods

- Observational cohort study
- Data from 8 national point-prevalence surveys in Norwegian hospitals, 2015-2017
- 43 hospitals, 937 patients, 1323 prescriptions



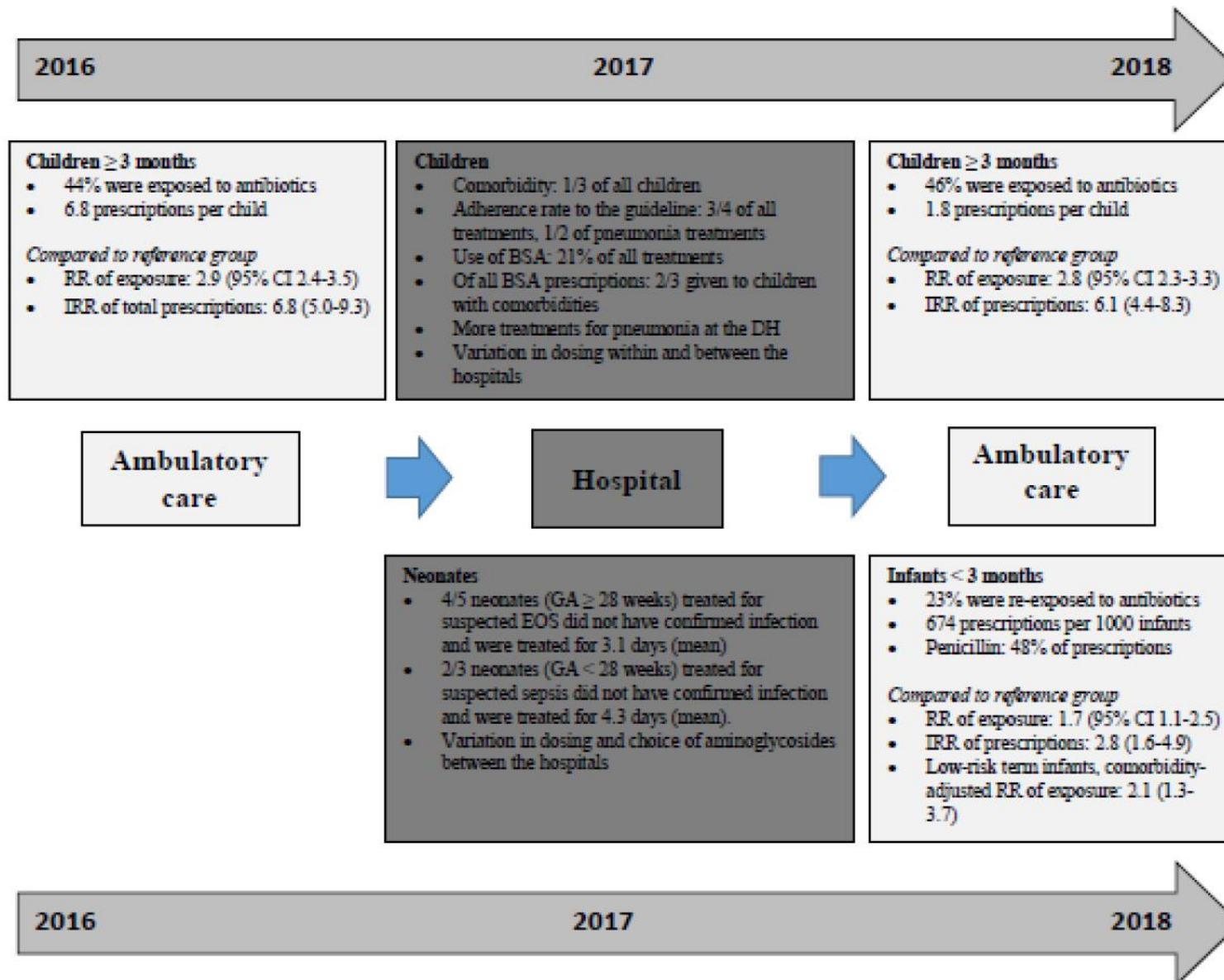
Thaulow CM et al. 2019. The Pediatric infectious disease journal. 38(4):384–389

PHD THESIS BY CHRISTIAN MAGNUS THAULOW MAY 2019

ANTIBIOTIC USE IN A COHORT OF NORWEGIAN CHILDREN AND NEONATES BEFORE, DURING AND AFTER HOSPITALISATION -EXPLORING FOCUS AREAS FOR ANTIBIOTIC STEWARDSHIP

1. Thaulow CM, Blix HS, Eriksen BH, Ask I, Myklebust TÅ and Berild D. Using a period incidence survey to compare antibiotic use in children between a university hospital and a district hospital in a country with low antimicrobial resistance: a prospective observational study. *BMJ Open* 2022;9:e027836. doi: 10.1136/bmjopen-2018-027836
2. Thaulow CM, Berild D, Blix HS, Brigtsen AK, Myklebust TÅ and Eriksen BH (2019) Can We Optimize Antibiotic Use in Norwegian Neonates? A Prospective Comparison Between a University Hospital and a District Hospital. *Front. Pediatr.* 7:440. doi: 10.3389/fped.2019.00440
3. Thaulow CM, Blix HS, Nilsen RM, Wathne JS, Eriksen BH, Berild D and Harthug S. Antibiotic use in children before, during and after hospitalisation. *Pharmacoepidemiol Drug Saf.* 2022 (in production) doi: 10.1002/pds.5438.
4. Christian Magnus Thaulow, Stig Harthug, Roy Miodini Nilsen, Beate Horsberg Eriksen, Jannicke Slettli Wathne, Dag Berild, Hege Salvesen Blix, Are infants exposed to antimicrobials during the first 3 months of life at increased risk of recurrent use? An explorative data-linkage study, *Journal of Antimicrobial Chemotherapy*, 2022; dkac024, <https://doi.org/10.1093/jac/dkac024>

Antibiotic Use In a Cohort of Norwegian Children



Surgical prophylaxis

- How is work flow for prescribing and administration of antibiotic prophylaxis?
- Which factors have impact on the practice?

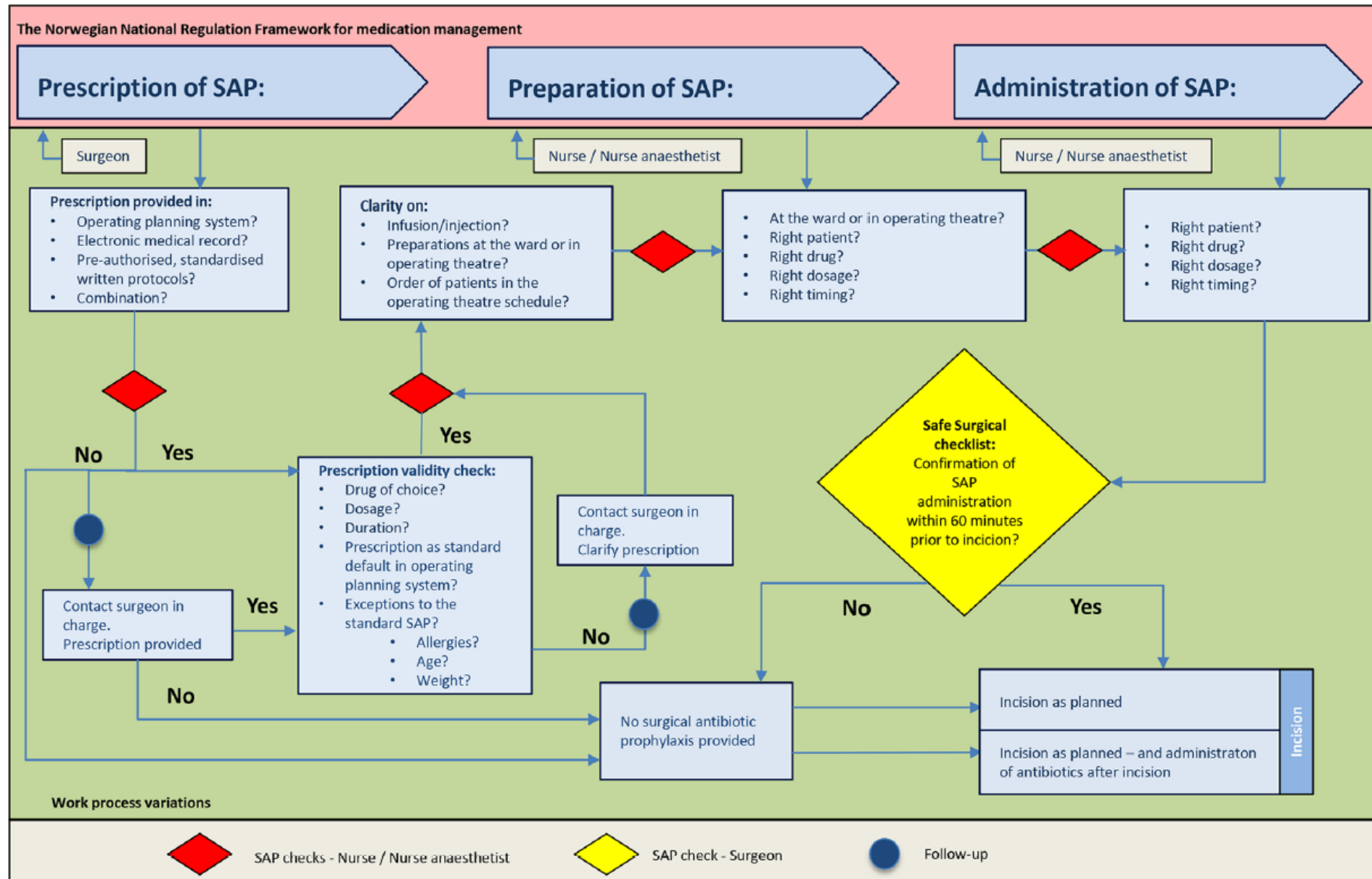


PhD: *Impact of the WHO Surgical Safety Checklist implementation on perioperative work and risk perceptions. A process evaluation by use of quantitative and qualitative methods*

Design and material

- Ethnographic study
- 3 hospitals in Western Norway
- Observations of surgical teams and single interviews with 19 physicians and nurses





The thesis reveals need for

- Knowledge
- Audit with feedback on relevant quality indicators
- Strengthening interdisciplinary teamwork



Research funding

1. Strategiske forskningsmidler i Helse Vest: Overvåkning av antibiotikaresistente bakterier
2. Strategiske forskningsmidler i Helse Vest: Kunnskap om implementering
3. Trond Mohn-midler: Forskningscenter for antibiotikaresistens
4. Nasjonalt forskningsnettverk for infeksjoner og nøktern bruk av antimikrobielle midler
5. Europeisk nettverk for tiltak for implementering av antibiotikastyring





Implement it!

Subproject 1: Scoping review
of patient safety interventions exemplified by ASP,
Medical Conciliation and Early Warning of
Deterioration in Hospitals

IMPLEMENT-IT

REVIEW OF LITERATURE REPORTING SUCCESSFUL IMPLEMENTATION OF ASP INCL. INCLUSIVE IMPLEMENTATION OUTCOME AND CONTEXTUAL SENSITIVE FACTORS FOR SUCCESS

Primary search in 3 databases: 2060 papers

Screening by researcher assisted machine learning (AI) – ASReview


- 49 papers of interest

PRELIMINARY RESULTS

Several publications describe active use of systematic QI strategies or tools, for example repeated PDSA runs including some degree of analytic approach to barriers and enablers of effective implementation – root cause analysis and fish bone diagrams aid the adaptation of guidelines, change work flow or adjust other inputs.

Factors often mentioned are:

- Insufficient IT, guidelines not fitting with real life, weak information flow in the clinical microteam, mismatch between needs and available HVW, weak engagement from managers, insufficient competence



TMS FUNDED PROJECT: RISK COMMUNICATION AND -PERCEPTION OF AMR IN THE PUBLIC AND AMONG HEALTHCARE WORKERS

HBE, UiB and Imperial college

THE CONSORTIUM AND SCIENTIFIC LEADERSHIP:

Investigators and leads of WP1: Brita Skodvin, HBE and Esmita Charani, Imperial

Investigator and lead of WP2: Jan Kjeldsen and Ragnhild Mølster, UiB

Investigator and lead of WP3: Anne Lise Fimreite, UiB

Lead investigator and lead of WP4: Ingrid Smith, HBE

AIM WP1:

To explore hospital HCWs` perception of risk and self-reported motivation to act and how these are shaped by the covid-19 and AMR pandemics, in order to develop targeted communication strategies to improve IPC and antibiotic prescribing practices, contributing to the containment of infectious diseases and AMR.

OBJECTIVES WP1:

To study hospital HCWs`

- perception of risk facing the covid-19 and AMR pandemics and how these perceptions are formed
- sources of information on the covid-19 and AMR pandemics
- self-reported motivation to change their IPC and antibiotic prescribing practices, facing the covid-19 and AMR pandemics and how these motivations are formed

To generate knowledge needed to develop targeted communication strategies to improve hospital HCWs practices in IPC and antibiotic prescribing, in order to contain AMR.

STUDY DESIGN WP1:

An explorative qualitative design is chosen to investigate hospital HCWs' perception of risk and motivation to act and how these are shaped by the covid-19 and AMR pandemics

INTERVIEWEES

HCWs involved in hospital clinical practice will be eligible to participate in the study.

A purposive sample of 50 HCWs representing A diversity in gender, ethnicity, geography, hospital characteristics (teaching and non-teaching), profession (physician and nurses, pharmacists, managers, other), specialty and experience will be interviewed.

Focus group interviews will be performed (5-6x), using semi-structured interview guide



CONCLUSION

