Implementation of check of medication appropriateness:

what can the computer do for ABS?

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eahp
european association of hospital pharmacists
making the difference in medication

EAHP Academy Seminars
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Disclosures

- No relevant financial conflict of interest

- With many thanks to Charlotte Quintens (PhD)

Interactive workshop

- Anonymous poll system

WIFI:
Join the poll via
PollEv.com/isabelspriet326

Learning objectives

- Understand the added-value of CMA within clinical pharmacy services
- Understand how to set up a CMA program in your own hospital
- Understand how to integrate quality indicators for ABS in CMA
- Identify what the added value could be of CMA for ABS next to bedside clinical pharmacy, initiatives of ID specialists and microbiologists and follow-up of the A-team

Select the country where you work

Content

Introduction

Clinical pharmacy in general

Medication safety & clinical pharmacy in BE: the set-up of CMA

CMA: what's in a name?

Antibiotic stewardship & quality indicators

Antibiotic stewardship in Leuven

Quality indicators

CMA-ABS care bundle

What can the computer do for ABS?

How to start?

Examples and Results

Strenghs and limitations

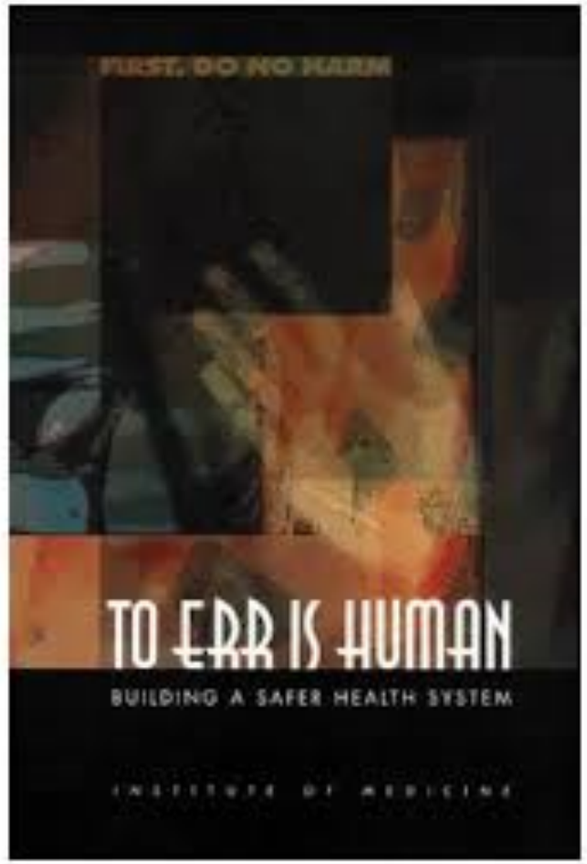
Introduction

Clinical pharmacy in general

Clinical pharmacy in Belgium & the set-up of back office CMA

CMA: what’s in a name?

A “momentum” for the startup of clinical pharmacy



- Institute of Medicine, 1999
- 44,000-98,000 deaths/yr
- Medical errors – 8th leading cause of death in the US

- Makary & Daniel, BMJ 2016
- Medical errors – 3th leading cause of death in the US

Key element to improve quality of care: optimization of patients’ pharmacotherapy

A “momentum” for the startup of clinical pharmacy

Wall Street Journal

Five steps to make hospitals less deadly

James Lieber – 17/05/2016

https://www.wsj.com/articles/how-to-make-hospitals-less-deadly-1463526075

- **Adopt structured handoffs.** Miscommunication during care transitions causes two-thirds of deaths and serious injuries from medical error, according to Lieber. A 2014 study published in the *New England Journal of Medicine* showed that adverse events can be reduced by 30% through structured handoffs that categorize illness severity, medical actions, and crisis contingency planning.
- **Involve pharmacists.** “A breakthrough in 20th-century care was allowing nurses to make rounds with doctors. Now it’s time to include pharmacists,” Lieber writes. Putting pharmacists in patient areas reduced errors by 45% and cut errors leading to death or severe harm by 94%, according to a 2001 study.
- **Get serious about infections.** Currently, Centers for Disease Control and Prevention (CDC) guidelines for disinfecting surgical tools, autoclaves, air and water sources, patient rooms, and labs need to be followed only after a major outbreak. “Hospitals and nursing homes should promise continual adherence to the guidelines, and hospital graders should include compliance as part of their ratings,” Lieber asserts.
- **Fight diagnostic errors. It’s impossible for c**linicians to keep up with the burgeoning array of molecular, genetic, and imaging technologies. Lieber suggests, therefore, that physicians should be able to bring pathologists and radiologists into the loop to make sure the correct test is ordered and the right diagnosis is offered.
- **Make electronic health records interoperable.** According to the federal government, only 14% of clinicians share data with doctors beyond their care organizations, thereby impeding diagnosis and jeopardizing treatment. Congress passed legislation last year directing interoperability within four years, but that is too long to wait, Lieber writes, adding that “providers and patient advocates should work to lower these firewalls as soon as possible.”

A “momentum” for clinical pharmacy

Other strategies to prevent ADE

- Digitalization with EHR including electronic prescribing
- Integration of clinical decision support systems
- Bedside scanning
- Unit based dosing

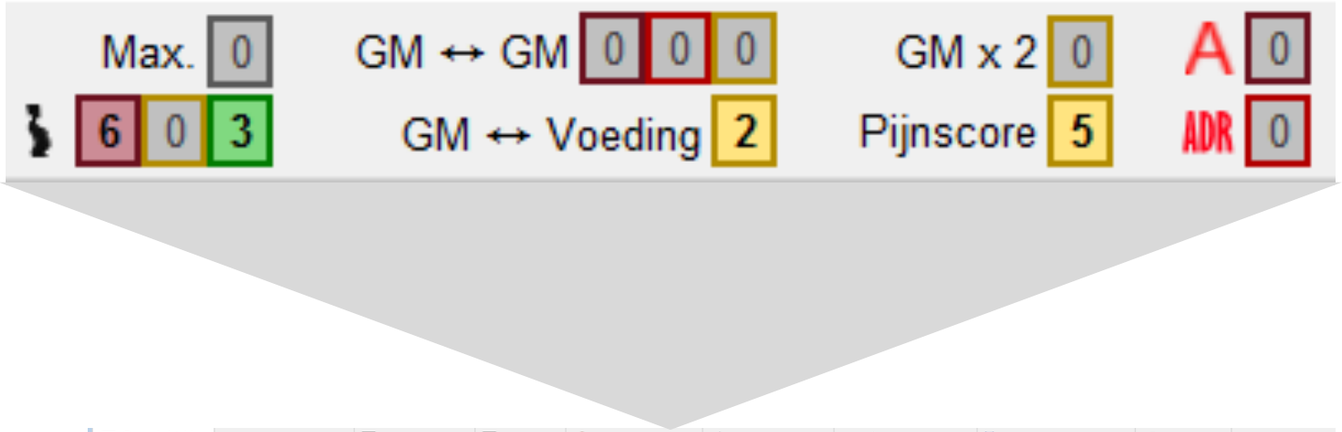
- **Implementation of clinical pharmacy activities**

Shift in the role of the hospital pharmacist

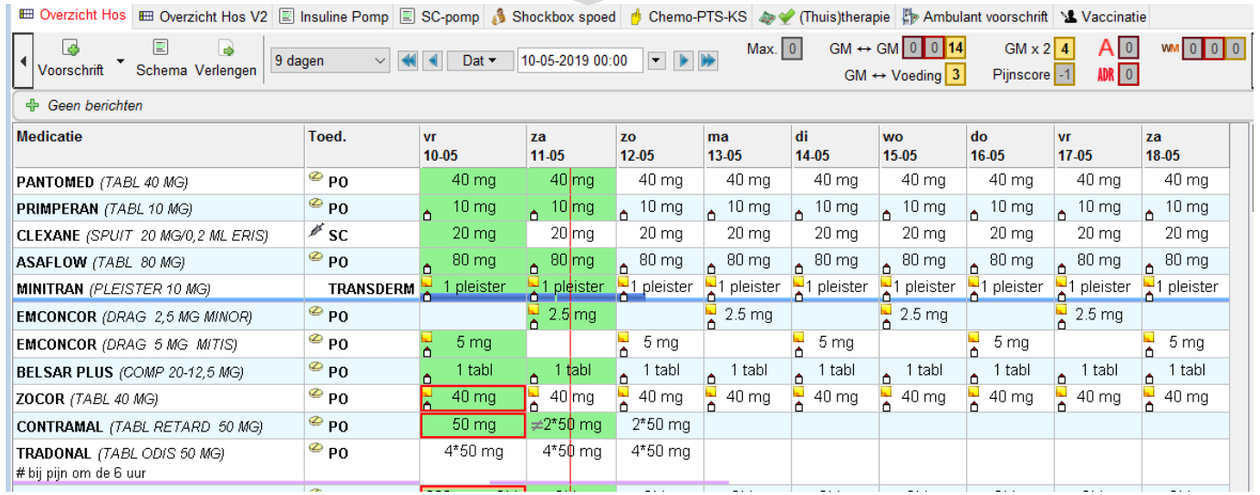
- USA/Canada/UK/Australia…:
  - Bedside clinical pharmacy implemented on all wards since the ’80s
- Development of clinical pharmacy services in Europe since 2000

Medication safety & clinical pharmacy in Belgium: a) CDSS

- Active contribution of clinical pharmacists to the development and implementation of CDSS



- **CDSS - basic**
  - (Drug-drug) interactions
  - Maximum doses
  - Drug use during pregnancy/lactation
  - Therapeutic duplication
  - Drug allergy



Medication safety & clinical pharmacy in Belgium: a) CDSS

- **Limitations**:
  - Information overload due to lack of specificity → *alert fatigue*
    - DDI: fixed screenings-interval (-7/+7d) + non-specific recommendations
  - Limited digital communication between different information systems → *CDSS still basic*

→ Prescribing physician's satisfaction is only moderate to low

Medication safety & clinical pharmacy in Belgium: b) bedside clinical pharmacy

- **Bedside clinical pharmacy**
  - Partially funded by the Belgian government

ACTA CLINICA BELGICA
2019, VOL. 74, NO. 2, 75–81
https://doi.org/10.1080/17843286.2018.1462877

Taylor & Francis
Taylor & Francis Group

ORIGINAL PAPER

Check for updates

Development of clinical pharmacy in Belgian hospitals through pilot projects funded by the government

A. Somers[a,b], A. Spinewine[a,c], I. Spriet[a,d,e], S. Steurbaut[a,f], P. Tulkens[a,g], J. D. Hecq[a,h], L. Willems[a,i], H. Robays[a,j], M. Dhoore[a,k], H. Yaras[a,l], I. Vanden Bremt[a,l] and M. Haelterman[a,m]

  - "Front-office services"
    - Attending ward rounds
    - Medication reconcilliation on admission
    - Medication review
    - Medication counseling at discharge
    - Projects focusing on high-risk drugs, DDI, antibiotic stewardship…

Medication safety & clinical pharmacy in Belgium: b) bedside clinical pharmacy

- FTE hospital pharmacists/ 100 beds

17.9

0.9
(0.24 (Bosnia) – 4.35 (UK))

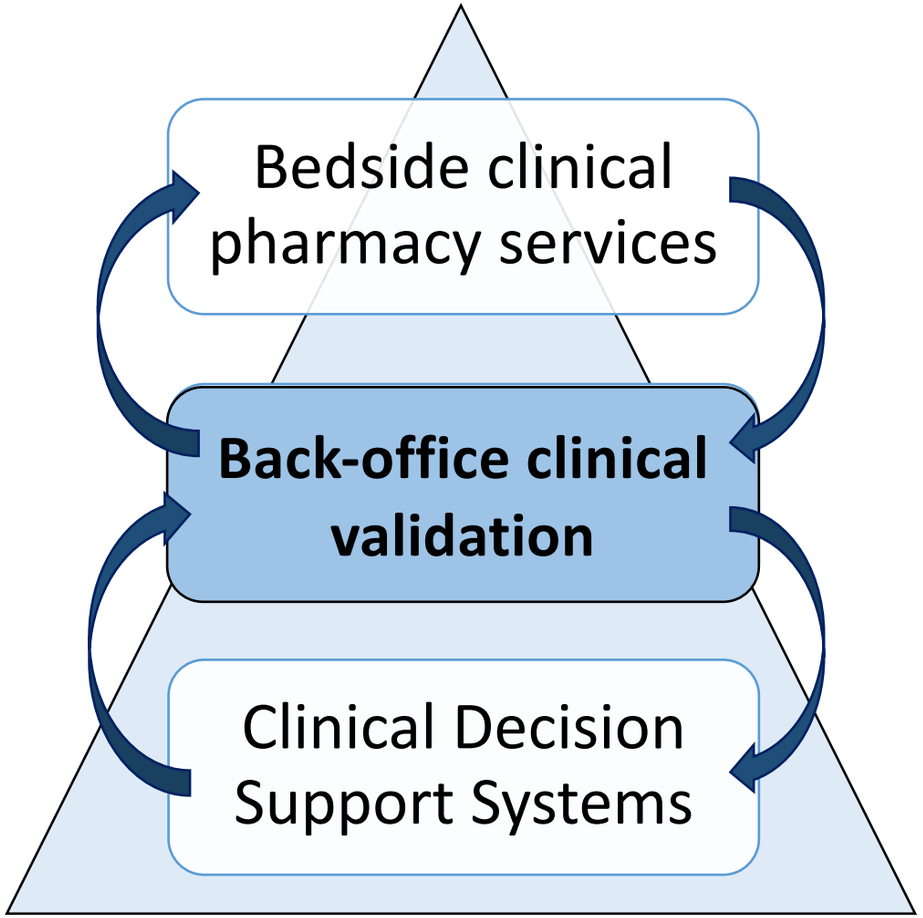
UZ LEUVEN

1.2

→ Implementation of bedside CP only on ”high risk”-wards
→ CDSS & limited bedside CP do not cover all medication-related problems/risks

Frontini et al. Eur J Hosp Pharm 2012;19:385-7

Medication safety & clinical pharmacy in Belgium: c) set-up of CMA

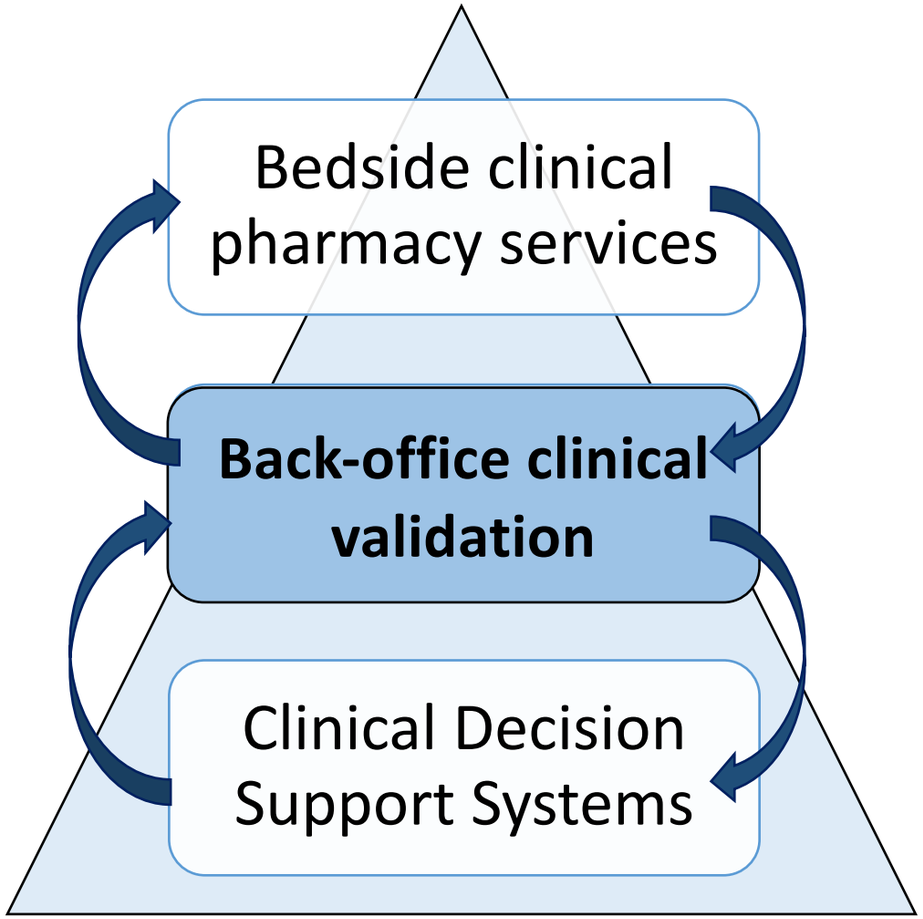


Back-office clinical pharmacy

Check of Medication Appropriateness (CMA)

Screening of patients at risk for potentially inappropriate medications (**PIM**) by clinical rules – validation by clinical pharmacist

Medication safety & clinical pharmacy in Belgium: c) set-up of CMA



Back-office clinical pharmacy

- Triggered by digitalization (EHR, CPOE, CDSS)
- Stimulated by hospital accreditation (JCI)
- 'Low' staff investment
- Centralized service

Target group:

1. For all patients at risk for potentially inappropriate medication (PIM)
2. Evaluation at any time during hospitalization
3. Evaluation independently of drug dispensing

How many FTE hospital pharmacists are employed in your hospital pharmacy?

< 1 FTE/100 beds

2 FTE/100 beds

1 FTE/100 beds

> 2 FTE/100 beds

How many FTEs are available for clinical pharmacy?

< 1 FTE/200 beds

1 FTE/200 beds

1 FTE/300 beds

> 1 FTE/300 beds

CMA: what's in a name?

Method:

Based on maximum integration of structured data from patient file

Risk analysis to identify high risk prescriptions

Formulating clinical rules (**queries)** to screen for high risk prescriptions

Daily screening of all prescriptions generating a worklist

Validation of the worklist by trained clinical pharmacists using **standardized algorithms**

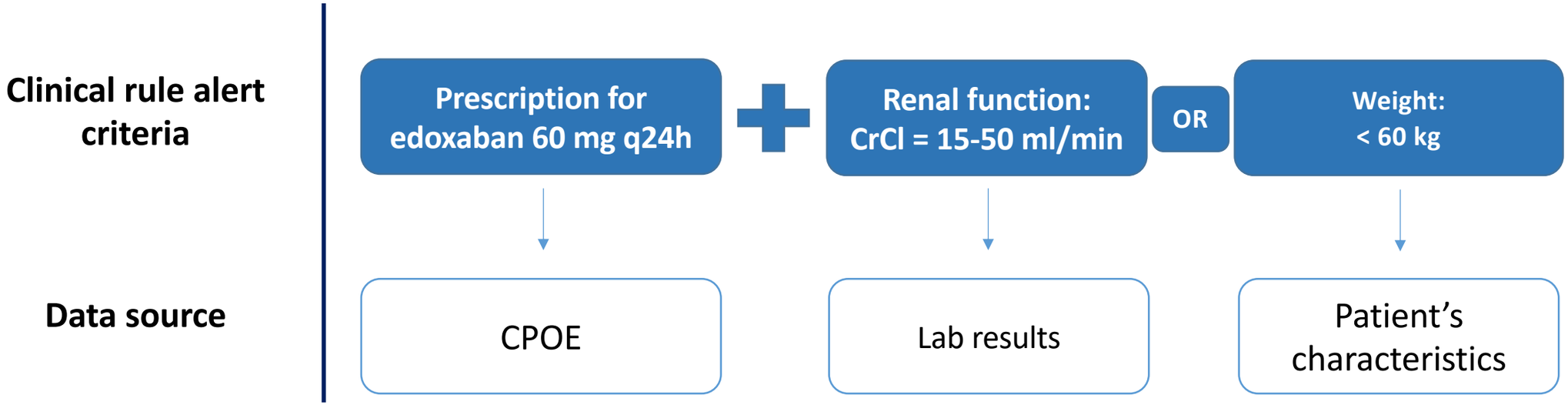
Interventions via electronic alerts or phone calls

CMA: what's in a name?

Risk analysis to identify patients at risk for PIM

Formulating **advanced clinical rules** to screen for high risk patients

Example: screening for incorrect dosing of edoxaban



CrCl: creatinine clearance

CMA: what's in a name?

Daily hospital-wide screening of all EHR generating a worklist

Based on maximum integration of structured data from EHR

Example: screening for incorrect dosing of edoxaban

30 prescriptions/day for edoxaban

Prescription for edoxaban 60 mg

> 1000 CrCl analyses daily

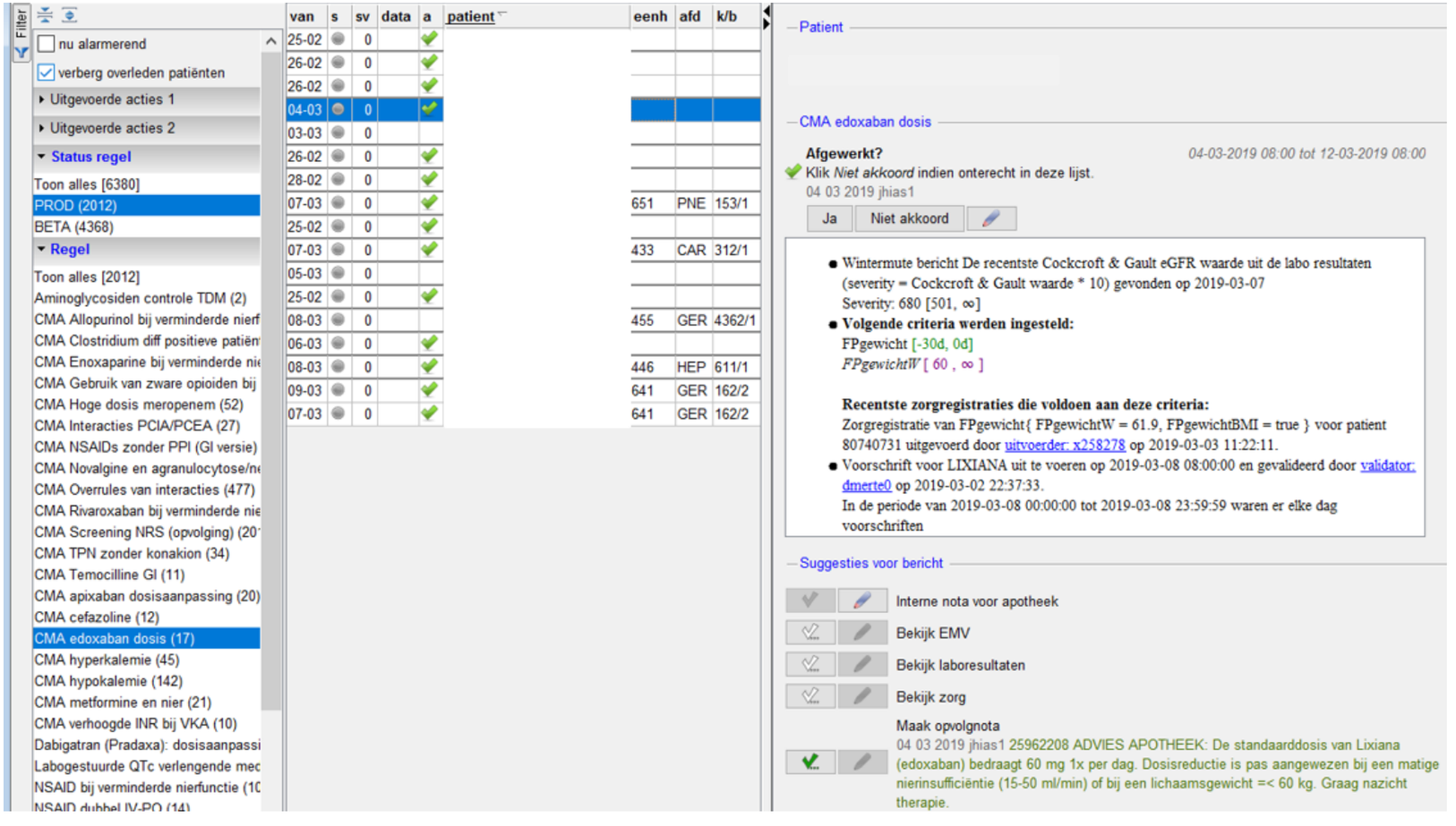
CrCl = 15-50 ml/min

= Worklist of < 3 lines/day to be checked by a hospital pharmacist

CMA: what's in a name?

Daily hospital-wide screening of all EHR generating a **worklist**

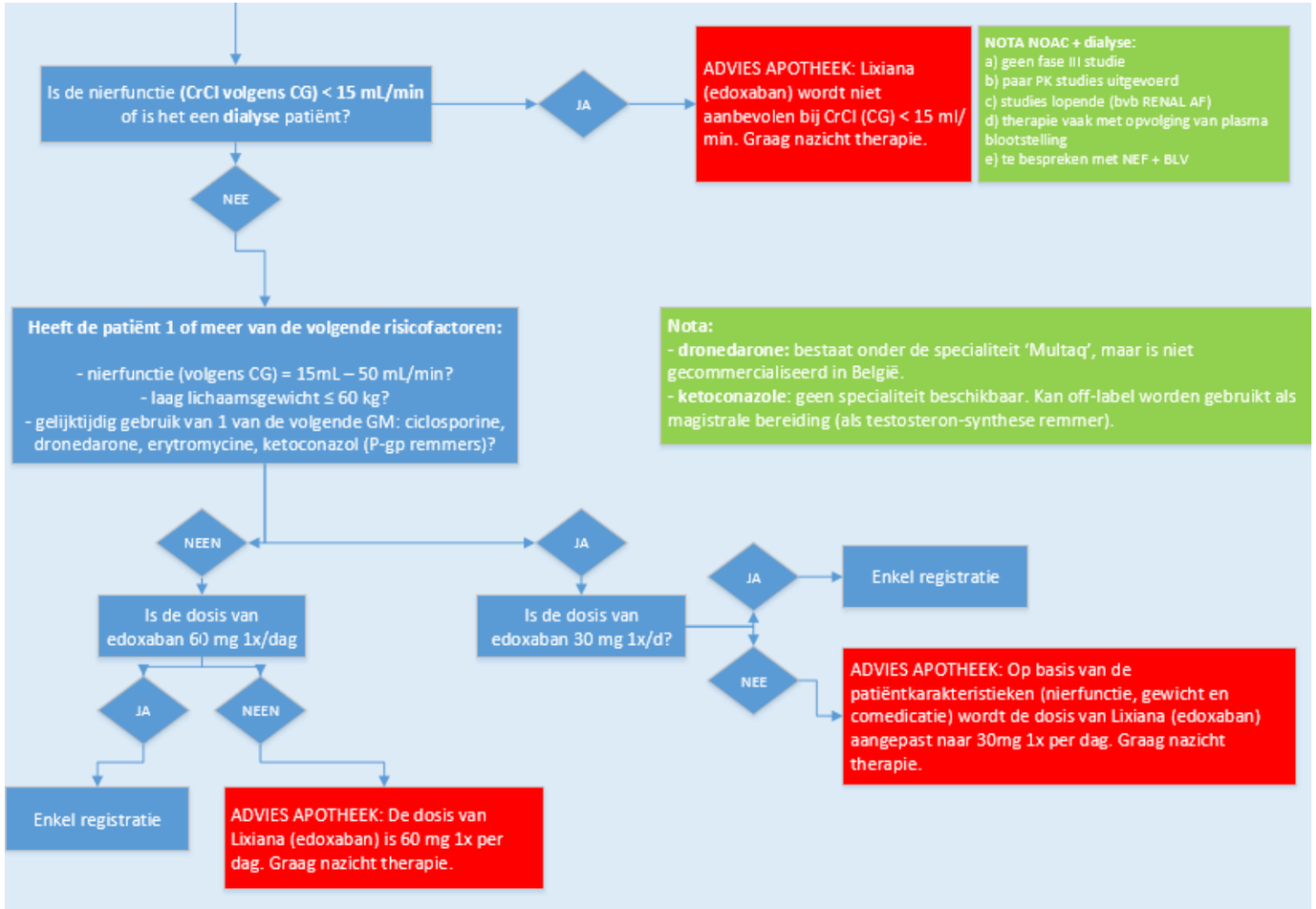
Example: screening for incorrect dosing of edoxaban



CMA: what's in a name?

Validation by trained clinical **pharmacists** using **standardized flowcharts**

Example: screening for incorrect dosing of edoxaban



CMA: what's in a name?

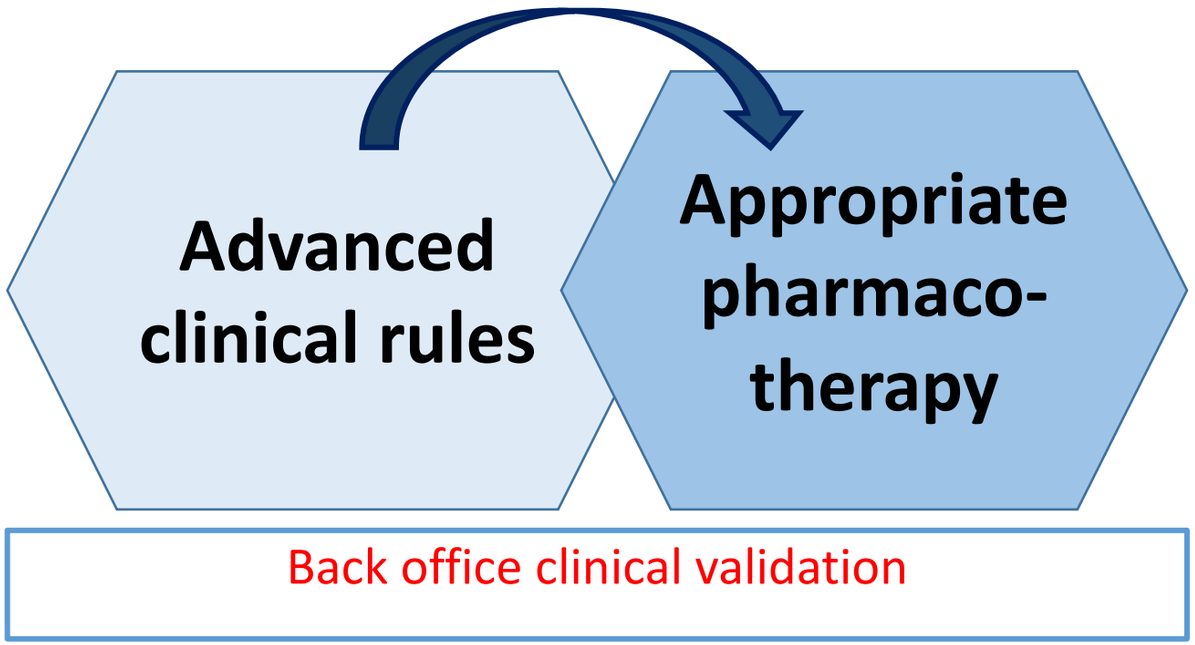
Interventions via electronic alerts or phone calls

Example: screening for incorrect dosing of edoxaban

- Intervention: call + electronic alert 

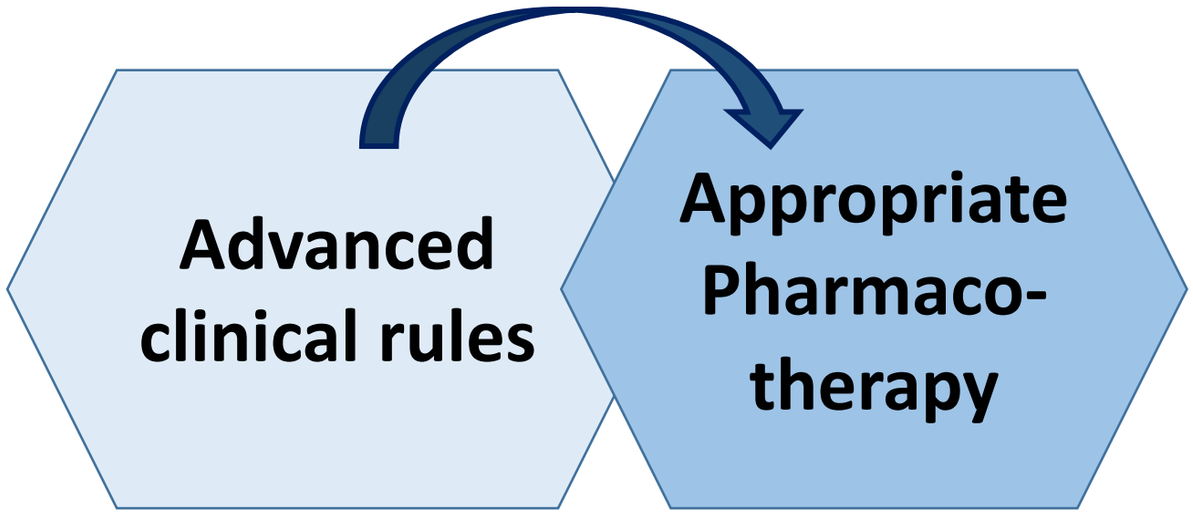
Afdeling	Template	Tekst	Contact type	Zender	Groep
GER	opvolgnota	ADVIES APOTHEEK: Op basis van de nierfunctie (CrCl < 50 ml/min) wordt de dosis van Lixiana (edoxaban) aangepast naar 30mg 1x per dag. Graag nazicht therapie.	hospitalisatie		apotheek

CMA: what's in a name?



- **Screen for:**
  - **Drug-related biochemical changes**
  - **Untreated indications or overtreatment**
  - **Adverse drug events**
  - **Adherence to guidelines**
  - **Drug-drug interactions**
  - **Dose adjustments**
  - **Implementation of TDM**

CMA: what's in a name?



**4 classes of drugs cause the majority of ADEs: analgesics, antimicrobials, anticoagulants & cardiovascular agents*

Varia

- DDI
- Drug-related biochemical changes

Anticoagulant Stewardship **(ACS)**

Post surgical pain therapy **(PSP)**

Antibiotic Stewardship **(ABS)**

Evans RS, et al. Ann Pharmacother 2005.

How are clinical pharmacy services organized?

No clinical pharmacy

Only BACK office clinical pharmacy

Only FRONT office clinical pharmacy

BACK + FRONT office clinical pharmacy

What kind of back office clinical validation are you providing?

No validation

Basic: without access to patient's medical record, e.g. only posology check

Intermediate: Limited acces to patient's medical record, e.g. posology, indication, interaction, allergy

Advanced: Full access to the patient's medical record

Antibiotic stewardship & quality indicators

Antibiotic stewardship in the University Hospitals Leuven

Quality indicators

CMA-ABS care bundle

What is the role of the hospital/clinical pharmacist in ABS?

Antibiotic management teams in Belgian hospitals: continued improvement in the period from 2007 to 2011

E. Van Gastel · E. Balligand · M. Costers · K. Magerman · on behalf of the Hospital Medicine Working Group of the Belgian Antibiotic Policy Coordination Committee

Eur J Clin Microbiol Infect Dis (2015) 34:673–677

- Antibiotic policy teams/ stewardship teams are obliged and financially supported in Belgium by the government
- Stewardship initiatives are followed up via an annual report

Table 4 Implementation of antibiotic stewardship initiatives (%) in acute care hospitals who joined the project in 2007 (group C), period 2007–2011

Antibiotic stewardship initiatives, group C, period 2007–2011	2007	2008	2009	2011
Antibiotic formulary	93.7	91.8	94.0	93.2
Guidelines for empirical and aetiological antibiotic therapy	85.1	81.6	84.0	84.1
Guidelines for antibiotic prophylaxis	93.7	87.8	96.0	86.4
Antimicrobial order forms	22.9	30.6	32.0	40.9
Requirement of justification and/or authorisation for specific antibiotics	58.3	61.2	70.0	72.7
Prospective audit with intervention and feedback	42.5	61.2	73.5	84.1
Automatic stop order	25.0	30.6	34.0	40.9
Streamlining or de-escalation of therapy	50.0	85.7	86.0	88.6
Parenteral to oral conversion	66.7	69.4	84.0	79.5
Analysis of antibiotic consumption	91.3	95.9	98.0	95.5
Analysis of microbial resistance	81.2	89.8	90.0	90.9

ABS in the University Hospitals Leuven

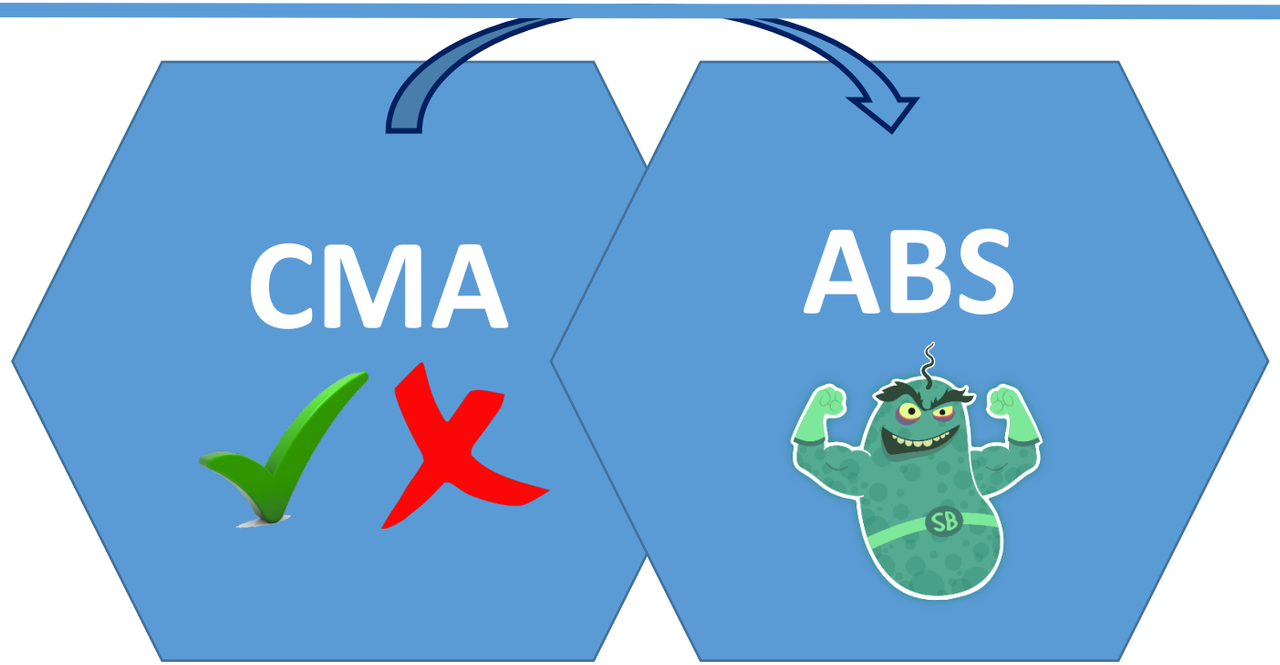
Antibiotic stewardship in the University Hospitals Leuven

- Antibiotic policy team ("A-team")
  - Local guidelines
  - National guidelines
  - Follow-up of consumption and resistance data
  - Newsletters, poster campaigns, …
- MID meetings (ICU, BJI, PJI, pediatrics, pulmonology, …)
- ID and microbiology consultations
- Specialized physicians and pharmacists

→ Daily check of prescriptions in CMA might contribute to ABS

[1]*Barlam TF, et al. Clin Infect Dis 2016.*
[2]*CDC. Core elements of hospital antibiotic stewardship programs 2014.*

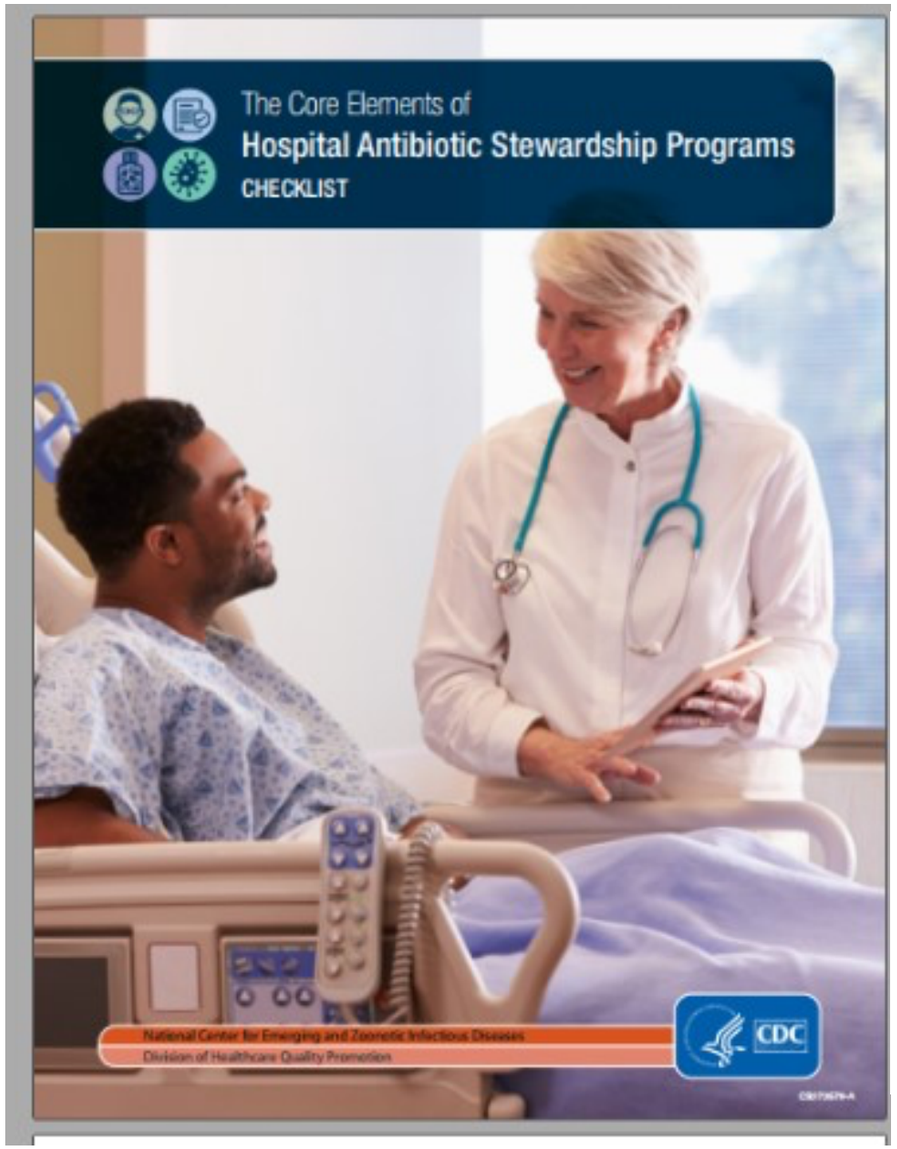
CMA-ABS in the University Hospitals Leuven



Development by A-team, pharmacists & IT department

1. Literature review
2. Definition of clinical rules
3. Translation of clinical rules into queries
4. Implementation in clinical practice
5. Follow-up of acceptance rate

CDC Checklist for ABS



ACTIONS TO SUPPORT OPTIMAL ANTIBIOTIC USE	
POLICIES	**POLICY ESTABLISHED**
A. Does your facility have a policy that requires prescribers to document in the medical record or during order entry a dose, duration, and indication for all antibiotic prescriptions?	❑ Yes ❑ No
B. Does your facility have facility-specific treatment recommendations, based on national guidelines and local susceptibility, to assist with antibiotic selection for common clinical conditions?	❑ Yes ❑ No
SPECIFIC INTERVENTIONS TO IMPROVE ANTIBIOTIC USE ***Are the following actions to improve antibiotic prescribing conducted in your facility?***	
BROAD INTERVENTIONS	**ACTION PERFORMED**
C. Is there a formal procedure for all clinicians to review the appropriateness of all antibiotics 48 hours after the initial orders (e.g. antibiotic time out)?	❑ Yes ❑ No
D. Do specified antibiotic agents need to be approved by a physician or pharmacist prior to dispensing (i.e., pre-authorization) at your facility?	❑ Yes ❑ No
E. Does a physician or pharmacist review courses of therapy for specified antibiotic agents (i.e., prospective audit with feedback) at your facility?	❑ Yes ❑ No
PHARMACY-DRIVEN INTERVENTIONS ***Are the following actions implemented in your facility?***	**ACTION PERFORMED**
F. Automatic changes from intravenous to oral antibiotic therapy in appropriate situations?	❑ Yes ❑ No
G. Dose adjustments in cases of organ dysfunction?	❑ Yes ❑ No
H. Dose optimization (pharmacokinetics/pharmacodynamics) to optimize the treatment of organisms with reduced susceptibility?	❑ Yes ❑ No
I. Automatic alerts in situations where therapy might be unnecessarily duplicative?	❑ Yes ❑ No
J. Time-sensitive automatic stop orders for specified antibiotic prescriptions?	❑ Yes ❑ No
DIAGNOSIS AND INFECTIONS SPECIFIC INTERVENTIONS ***Does your facility have specific interventions in place to ensure optimal use of antibiotics to treat the following common infections?***	**ACTION PERFORMED**
K. Community-acquired pneumonia	❑ Yes ❑ No
L. Urinary tract infection	❑ Yes ❑ No
M. Skin and soft tissue infections	❑ Yes ❑ No

On institutional level
Very general

Cochrane Library

Cochrane Database of Systematic Reviews

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

Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S

Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, Gould IM, Ramsay CR, Michie S.
Interventions to improve antibiotic prescribing practices for hospital inpatients.
Cochrane Database of Systematic Reviews 2017, Issue 2. Art. No.: CD003543.
DOI: 10.1002/14651858.CD003543.pub4.

www.cochranelibrary.com

WILEY

Clinical Infectious Diseases

IDSA GUIDELINE

Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America

Tamar F. Barlam,[1,a] Sara E. Cosgrove,[2,a] Lilian M. Abbo,[3] Conan MacDougall,[4] Audrey N. Schuetz,[5] Edward J. Septimus,[6] Arjun Srinivasan,[7] Timothy H. Dellit,[8] Yngve T. Falck-Ytter,[9] Neil O. Fishman,[10] Cindy W. Hamilton,[11] Timothy C. Jenkins,[12] Pamela A. Lipsett,[13] Preeti N. Malani,[14] Larissa S. May,[15] Gregory J. Moran,[16] Melinda M. Neuhauser,[17] Jason G. Newland,[18] Christopher A. Ohl,[19] Matthew H. Samore,[20] Susan K. Seo,[21] and Kavita K. Trivedi[22]

[1]Section of Infectious Diseases, Boston University School of Medicine, Boston, Massachusetts; [2]Division of Infectious Diseases, Johns Hopkins University School of Medicine, Baltimore, Maryland;

GUIDELINES

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

Timothy H. Dellit,[1] Robert C. Owens,[2] John E. McGowan, Jr.,[3] Dale N. Gerding,[4] Robert A. Weinstein,[5] John P. Burke,[6] W. Charles Huskins,[7] David L. Paterson,[8] Neil O. Fishman,[9] Christopher F. Carpenter,[10] P. J. Brennan,[9] Marianne Billeter,[11] and Thomas M. Hooton[12]

[1]University Medical Center and the University of Washington, Seattle; [2]Maine Medical Center, Portland; [3]Emory University, Atlanta, Georgia;

Clinical Infectious Diseases

INVITED ARTICLE

CLINICAL PRACTICE: Ellie J. C. Goldstein, Section Editor

Eight Habits of Highly Effective Antimicrobial Stewardship Programs to Meet the Joint Commission Standards for Hospitals

Debra A. Goff,[1] Ravina Kullar,[2] Karri A. Bauer,[2] and Thomas M. File Jr[3]

[1]The Ohio State University Wexner Medical Center, The Ohio State University College of Pharmacy, Columbus, Ohio; [2]MRL, Merck & Co., Inc.,Kenilworth, New Jersey; and [3]Division of Infectious Disease, Northeast Ohio Medical University, and Summa Health, Akron, Ohio

INVITED ARTICLE QUALITY IMPROVEMENT

Trish M. Perl, Section Editor

Quality Indicators to Measure Appropriate Antibiotic Use in Hospitalized Adults

Caroline M. A. van den Bosch,[1] Suzanne E. Geerlings,[1] Stephanie Natsch,[2] Jan M. Prins,[1] and Marlies E. J. L. Hulscher[3]

[1]Department of Internal Medicine, Division of Infectious Diseases, Academic Medical Center, University of Amsterdam, and Departments of [2]Clinical Pharmacology and [3]Scientific Institute for Quality of Healthcare, Radboud University Medical Center, Nijmegen, The Netherlands

Table 3. Results of the Delphi Procedure: First Questionnaire, Consensus Meeting, and Second Questionnaire

		First Questionnaire				Second Questionnaire		
Quality Indicators	Level of Supporting Evidence (See Tables 1 and 2)	Median	% in Highest Tertile	Conclusion	Consensus Meeting	No. of Experts	Total Score	Conclusion
1. In hospitalized adults with a suspected bacterial infection, empirical therapy should be started intravenously.	4	6	47	Rejected[a]				
2. In hospitalized adults with a suspected bacterial infection, empirical therapy should be started as soon as possible, preferably within the first hour of presentation.	2	8	57	Discuss[b]	Rejected			
3. In hospitalized adults with a suspected bacterial infection, empirical therapy should be started within 4 h after clinical presentation.	2 (pneumonia) 4 (UTIs)	7	69	Rejected				
4. In hospitalized adults with a suspected bacterial infection, empirical therapy should be started within 8 h after arrival in the emergency department.	2	7	53	Rejected				
5. In hospitalized adults with a suspected bacterial infection, empirical therapy should be administered while the patient is in the emergency department.	2	6	50	Rejected				
6. Before starting systemic antibiotic therapy in hospitalized adults with a suspected bacterial infection, at least 2 sets of blood cultures should be taken.	2 (severe pneumonia) 3 (sepsis)	8	80	Accepted[c]	Accepted	7	15	Accepted and selected for top 6
7. Blood cultures before start of antibiotics should be obtained from hospitalized patients with a suspected bacterial infection and the clinical indication listed here: ICU admission, cavitary infiltrates, leukopenia, active alcohol abuse, chronic severe	2	8	53	Discuss	Rejected			

Current evidence on hospital antimicrobial stewardship objectives: a systematic review and meta-analysis

Emelie C Schuts, Marlies E J L Hulscher, Johan W Mouton, Cees M Verduin, James W T Cohen Stuart, Hans W P M Overdiek, Paul D van der Linden, Stephanie Natsch, Cees M P M Hertogh, Tom F W Wolfs, Jeroen A Schouten, Bart Jan Kullberg, Jan M Prins

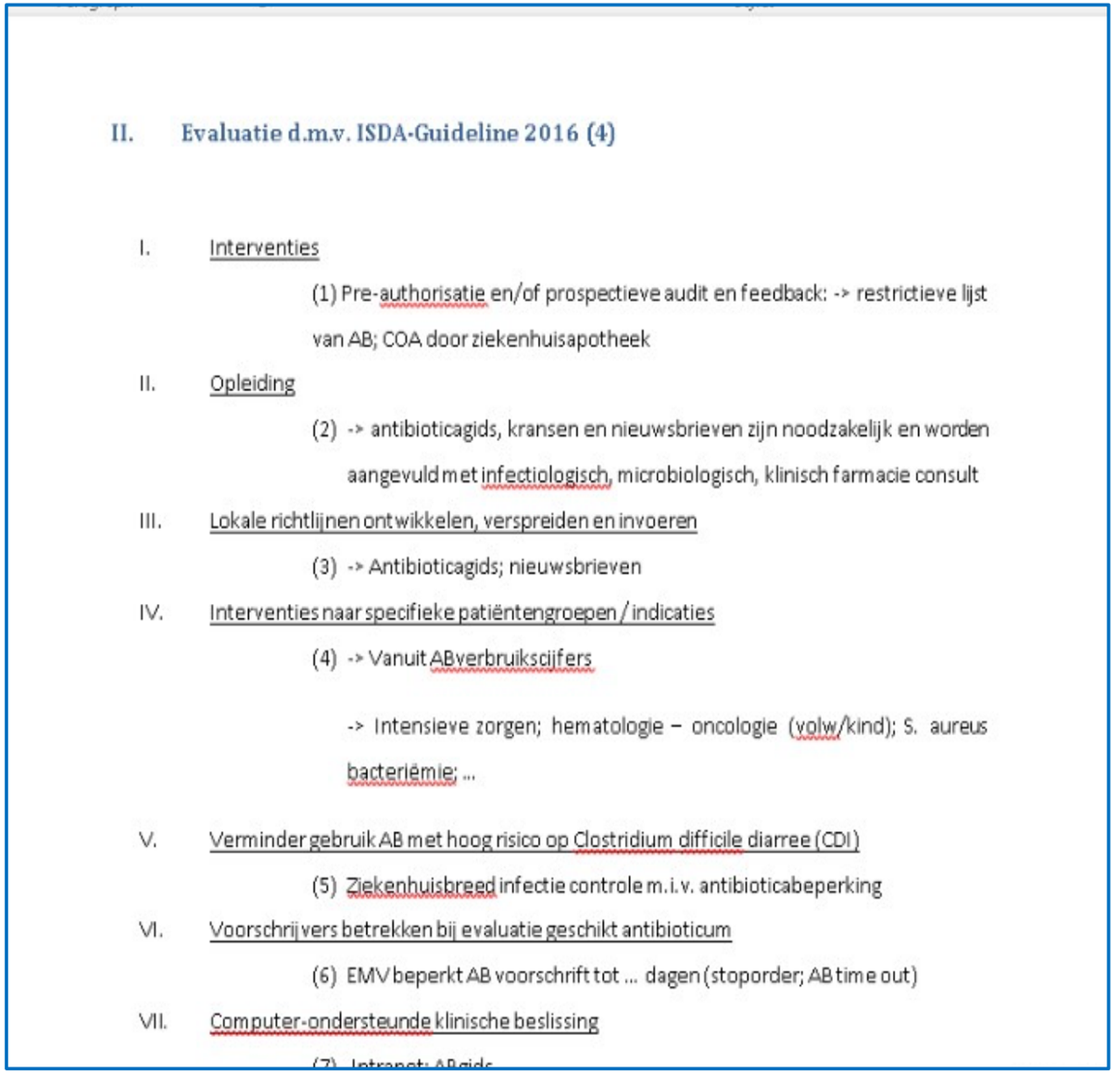
	Definitions
Empirical therapy according to the guidelines	Empirical systemic antibiotic therapy prescribed according to local guide or national guidelines*
Blood cultures	Take at least two sets of blood cultures before starting systemic antibiotic therapy
Cultures from the site of infection	Take cultures from suspected sites of infection, preferably before starting systemic antibiotic therapy
De-escalation of therapy	Change to narrow-spectrum antibiotic or stop antibiotics as soon as culture results are available[10–13]
Adjustment of therapy to renal function	Adjustment of dose and dosing interval of systemic antibiotics
Switch from intravenous to oral therapy	Switch after 48–72 h, when the clinical condition of the patient is stable, oral intake and gastrointestinal absorption are adequate, and when sufficiently high concentrations in blood with a suitable oral antibiotic can be achieved[10,14,15]
Documented antibiotic plan	Documented antibiotic plan should include indication, drug name and dose, and administration route and interval, and should be included in the case notes at the start of systemic antibiotic treatment
Therapeutic drug monitoring	NA
Discontinuation of antibiotic therapy if infection is not confirmed	Discontinuation of empirical treatment based on lack of clinical or microbiological evidence of infection†
Presence of a local antibiotic guide	Local antibiotic guide present in the hospital and assessed for update every 3 years
Local antibiotic guide in agreement with national antibiotic guidelines	Corresponds for all features but can deviate on the basis of local resistance patterns
List of restricted antibiotics	Removal of specific antibiotics from the formulary or restriction of use by requiring preauthorisation by a specialist (infectious diseases or medical microbiology) or allowing use for only 72 h with mandatory approval for further use; studies in outbreak settings excluded
Bedside consultation	Formal consultation by an infectious disease specialist leading to written comments and advice on treatment based on physical examination and review of medical records (informal consultation, for example by telephone, does not count as bedside consultation)
Assessment of patients' adherence	NA

NA=not applicable. *All results extracted if both reported. †Studies only reporting on differences between discontinuing and continuing treatment were included, whereas those including more general reports on de-escalation of therapy (broad to narrower spectrum or stopping treatment based on culture results) were included in the review of de-escalation of therapy.

Table 1: **Antimicrobial stewardship objectives included in systematic review**

- Summary of all potential elements contributing to ABS
- Discussion in A-team
  - Evaluation if we had these in place
  - Evaluation if and how CMA could contribute

1. Literature review
2. Definition of clinical rules
3. Translation of clinical rules into queries
4. Implementation in clinical practice
5. Follow-up of acceptance rate



II. Evaluatie d.m.v. ISDA-Guideline 2016 (4)

I. Interventies

(1) Pre-authorisatie en/of prospectieve audit en feedback: -> restrictieve lijst van AB; COA door ziekenhuisapotheek

II. Opleiding

(2) -> antibioticagids, kransen en nieuwsbrieven zijn noodzakelijk en worden aangevuld met infectiologisch, microbiologisch, klinisch farmacie consult

III. Lokale richtlijnen ontwikkelen, verspreiden en invoeren

(3) -> Antibioticagids; nieuwsbrieven

IV. Interventies naar specifieke patiëntengroepen / indicaties

(4) -> Vanuit ABverbruikscijfers

-> Intensieve zorgen; hematologie – oncologie (volw/kind); S. aureus bacteriëmie; ...

V. Verminder gebruik AB met hoog risico op Clostridium difficile diarree (CDI)

(5) Ziekenhuisbreed infectie controle m.i.v. antibioticabeperking

VI. Voorschrijvers betrekken bij evaluatie geschikt antibioticum

(6) EMV beperkt AB voorschrift tot ... dagen (stoporder; AB time out)

VII. Computer-ondersteunde klinische beslissing

(7) Intranet: AB gids

What can the computer do for ABS?

How to start?

Examples and Results

Strengths and limitations

How to start? - Requirements

Approval by the hospital direction & support in strategic decisions

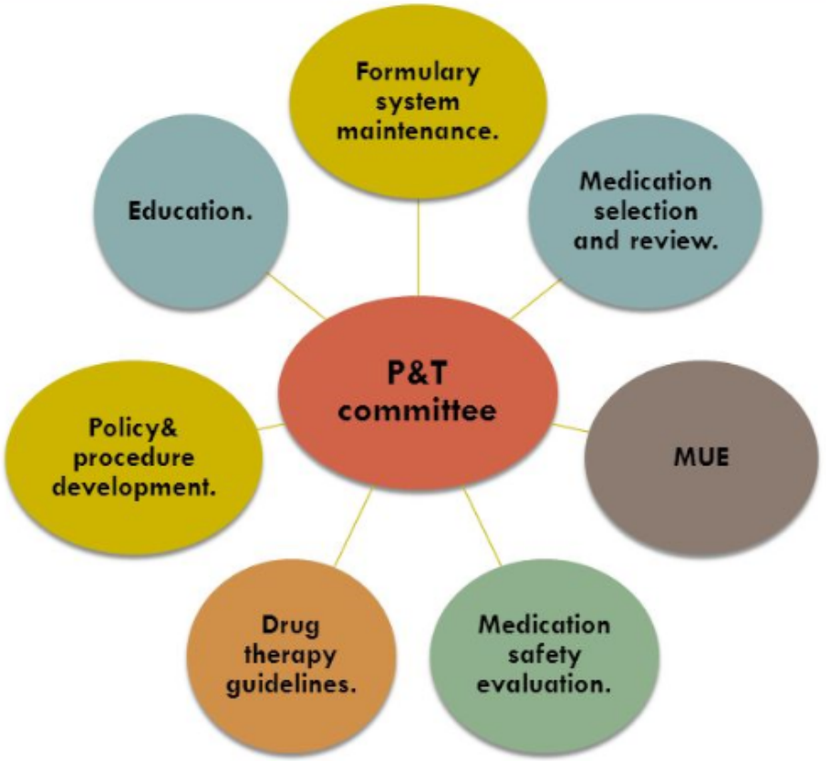
Clinical input - to define the clinical rules

Collaboration with IT – to translate the clinical rules into queries

Follow-up of service - registration, audit, feedback, …

How to start? - Hospital direction/strategic decisions

- Hospital Board
  - Approval of new service
  - Hospital wide communication on start of new service – newsletter
- Pharmaceutical and Therapeutics (P&T) Committee
  - Identifying high risk prescriptions
  - Validation of algorithms
- Ethical approval
  - Full access to EHR



- Relevant national professional associations
- Partner Hospitals

How to start? - Hospital direction/strategic decisions

- **Human resources:**
  - How many FTE will be provided for backoffice clinical validation?
  - How many FTE will be provided for the coordination of CMA (literature review, development of clinical rules, contact with IT, implementation, training of clinical pharmacists, data analysis, …)?

- **“Facilitated” by accreditation:**
  - JCI
  - NIAZ Qmentum

  - Specific section on ABS in latest JCI requirements

Nederlands Instituut voor Accreditatie in de Zorg

Medication Management and Use (MMU)

Joint Commission International

6th Edition | Effective 1 July 2017

1.1 Standard MMU.1.1

The hospital develops and implements a program for the prudent use of antibiotics based on the principle of antibiotic stewardship.

1.1.2 Measurable Elements of MMU.1.1

- ☐ 1. The hospital develops and implements a program for antibiotic stewardship that involves infection prevention and control professionals, physicians, nurses, pharmacists, trainees, patients, families, and others. (*Also see* PCI.2, MEs 2 and 3)
- ☐ 2. The program is based on scientific evidence, accepted practice guidelines, and local laws and regulations. (*Also see* QPS.3 and GLD.2, ME 5)
- ☐ 3. The program includes guidelines for the optimal use of antibiotic therapy for treatment of infections,
  including the proper use of prophylactic antibiotic therapy. (*Also see* GLD.11.2)
- ☐ 4. There is a mechanism to oversee the program for antibiotic stewardship.
  (*Also see* MMU.2.1, ME 1)
- ☐ 5. The effectiveness of the antibiotic stewardship program is monitored

How to start? - Hospital direction/strategic decisions

- Before or regardless of drug dispensing?

CMA before drug dispensing

Validation of drugs before dispensing

- Deadline stress
- Low performance
- Missing decentralized drug dispensing

Independent services

- High performance
- Check decentralized drug dispensing

Administration of drugs before validation

How to start? - Clinical input

II. Evaluatie d.m.v. ISDA-Guideline 2016 (4)

I. Interventies

(1) Pre-authorisatie en/of prospectieve audit en feedback: -> restrictieve lijst van AB; COA door ziekenhuisapotheek

II. Opleiding

(2) -> antibioticagids, kransen en nieuwsbrieven zijn noodzakelijk en worden aangevuld met infectiologisch, microbiologisch, klinisch farmacie consult

III. Lokale richtlijnen ontwikkelen, verspreiden en invoeren

(3) -> Antibioticagids; nieuwsbrieven

IV. Interventies naar specifieke patiëntengroepen / indicaties

(4) -> Vanuit ABverbruikscijfers

-> Intensieve zorgen; hematologie – oncologie (volw/kind); S. aureus bacteriëmie; ...

V. Verminder gebruik AB met hoog risico op Clostridium difficile diarree (CDI)

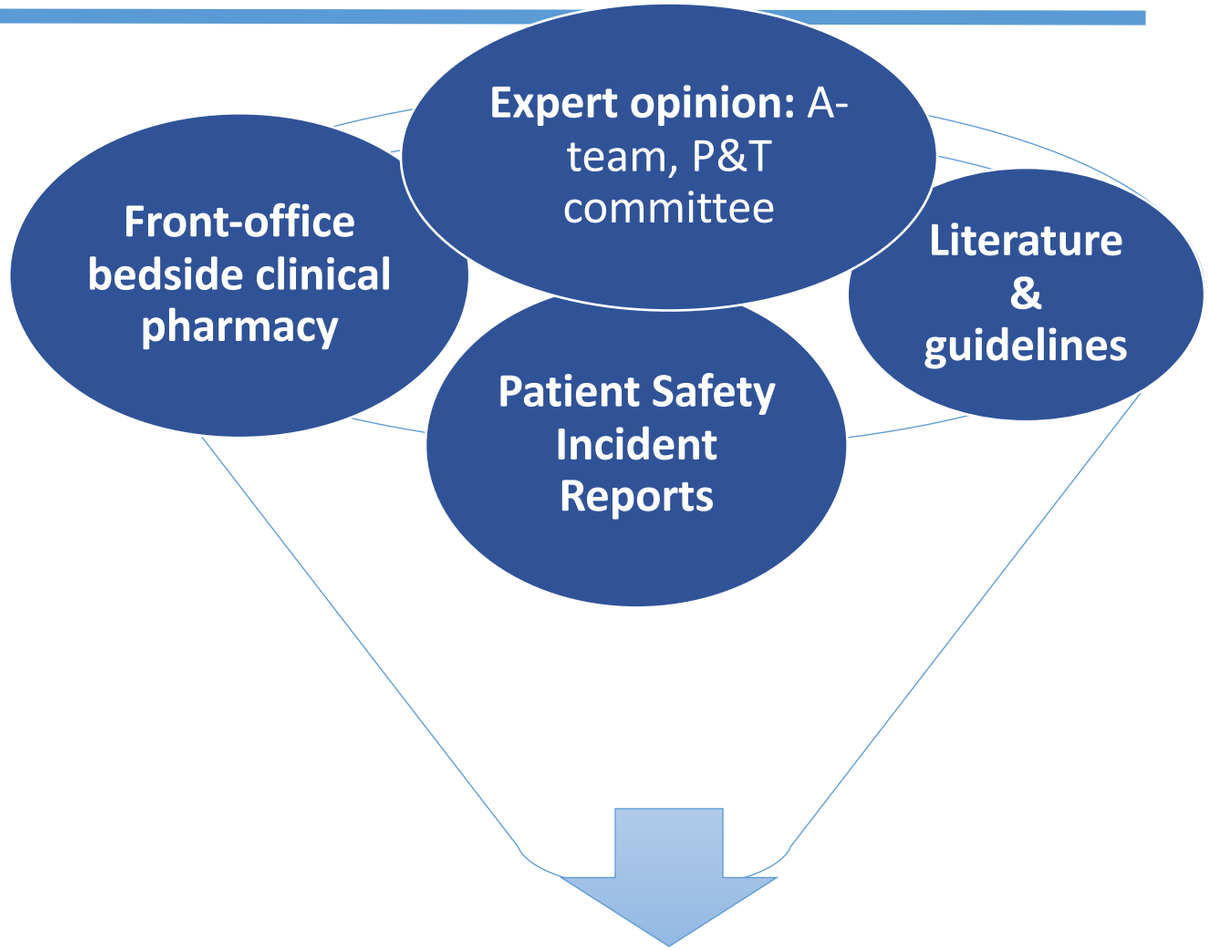
(5) Ziekenhuisbreed infectie controle m.i.v. antibioticabeperking

VI. Voorschrijvers betrekken bij evaluatie geschikt antibioticum

(6) EMV beperkt AB voorschrift tot ... dagen (stoporder; AB time out)

VII. Computer-ondersteunde klinische beslissing

(7) Intranet: ABgids



Defining advanced clinical rules

How to start? - Clinical input – definition of the clinical rules

Case:

- Female, 84 y, 52 kg
- Admission at geriatric dpt.
- Diagnosis: UTI & delirium
- Medical history: Afib, DMII, Chronic Renal Insufficiency (CKD-EPI 22 mL/min.1.73m2)
- Culture results:
  - *UC: E.coli:* S/ levofloxacin, amoxiclav
  - *Stool: Clostridium difficile* +

Prescribed medication
Amoxiclav PO 875/125 mg q8h
Apixaban PO 5 mg q12h
Zolpidem PO 10 mg q24h
Metformin PO 850 mg q8h
Paracetamol IV 1g q6h
Carbamazapine PO 200 mg q12h

Which checks would you carry out on this prescription?

Prescribed medication
Amoxiclav PO 875/125 mg q8h
Apixaban PO 5 mg q12h
Zolpidem PO 10 mg q24h
Metformin PO 850 mg q8h
Paracetamol IV 1g q6h
Carbamazapine PO 200 mg q12h

Posology **A**

Dose adjustments in RI **B**

DDI **C**

IV to oral switch **D**

Untreated indications **E**

Choice of drug per specific indication **F**

Drug-allergy **G**

How to start? - Clinical consensus on…

A. What is the standard posology used for a specific indication?

- **Amoxicillin/clavulanic acid**
  - UTI: e.g. ESCMID guidelines[1]
- **Apixaban**
  - Afib: e.g. ESC guidelines[2,3]
  - Standard dosing Afib: 2x 5 mg
  - Posology based on indication, weight, renal function and age

ESCMID EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

EUROPEAN SOCIETY OF CARDIOLOGY

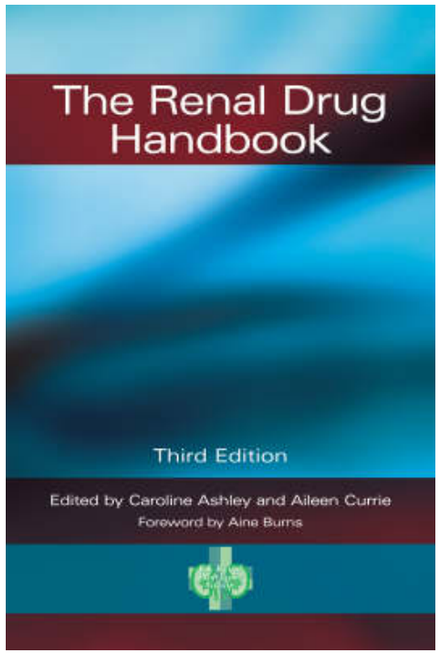
(1) Gupta K, et al. Clin Infect Dis 2011:52(5):e103-120.
(2) Kirchhof P, et al. Eur Heart Journal 2016:37(38):2893-296.
(3) Heidbuchek H, et al. Eurospace 2015:17:1467-1507.

How to start? - Clinical consensus on…

B. How should doses be adjusted in renal insufficiency?

- Amoxicillin/clavulanic acid
- Apixaban[(1)]
- Metformin[(2)]

- **Guidelines:**
  - Renal Drug Handbook[(2)]
  - Clinicalpharmacology.com
  - Summary of product characteristics (SmPC)



(1) Heidbuchek H, et al. Eurospace 2015:17:1467-1507.
(2) ADA: Standards of Medical Care in Diabetes; 2016.
(3) Ashley C., et al. Aust Prescr. 2015;38(2).

How to start? - Clinical consensus on…

C. How will we deal with severe DDIs?

- **Apixaban + carbamazepine[(1)]**
  - CYP3A4 substrate + CYP inducer
  - Decrease in serum concentration of apixaban
    - Effect on apixaban plasma level (AUC): - 54%
- **Interaction databases:**
  - e.g. UpToDate.com (Lexicomp®), Clinicalpharmacology.com

(1) Heidbuchek H, et al. Eurospace 2015:17:1467-1507.

How to start? - Clinical consensus on…

D. IV-ORAL switch

- **Paracetamol IV?**
  - Which drugs are considered bio-equivalent?
  - Which criteria should be fulfilled before IV to oral switch is recommended?
    - Absence of swallowing problems
    - Normal GI motility
    - Intake of other oral medication
    - Lack of anti-emetic drugs
    - …

How to start? - Clinical consensus on…

E. Will we also screen for untreated indications?

- ***Clostridium difficile* infection (CDI)**
  - IDSA guidelines(1), ESCMID guidelines (2)
  - Diagnosis: presence of symptoms (diarrhea)+ stool test positive for toxins

Table 1. Recommendations for the Treatment of *Clostridium difficile* Infection in Adults

Clinical Definition	Supportive Clinical Data	Recommended Treatment[a]	Strength of Recommendation/ Quality of Evidence
Initial episode, non-severe	Leukocytosis with a white blood cell count of ≤15000 cells/mL and a serum creatinine level <1.5 mg/dL	• VAN 125 mg given 4 times daily for 10 days, OR • FDX 200 mg given twice daily for 10 days • Alternate if above agents are unavailable: metronidazole, 500 mg 3 times per day by mouth for 10 days	Strong/High Strong/High Weak/High
Initial episode, severe[b]	Leukocytosis with a white blood cell count of ≥15000 cells/mL or a serum creatinine level >1.5 mg/dL	• VAN, 125 mg 4 times per day by mouth for 10 days, OR • FDX 200 mg given twice daily for 10 days	Strong/High Strong/High

(1) Clifford McDonald L, et al. Clin Infect Dis 2018.
(2) Tschudin-Sutter S, et al. Clin Microbiol Inf 2018.

How to start? - Clinical consensus on…

F. How should we deal with previously reported allergies?

- **Penicillin allergy?**

(1) Kirchhof P, et al. Eur Heart Journal 2016:37(38):2893-296.
(2) Ashley C., et al. Aust Prescr. 2015;38(2).

How to start? - Clinical consensus on…

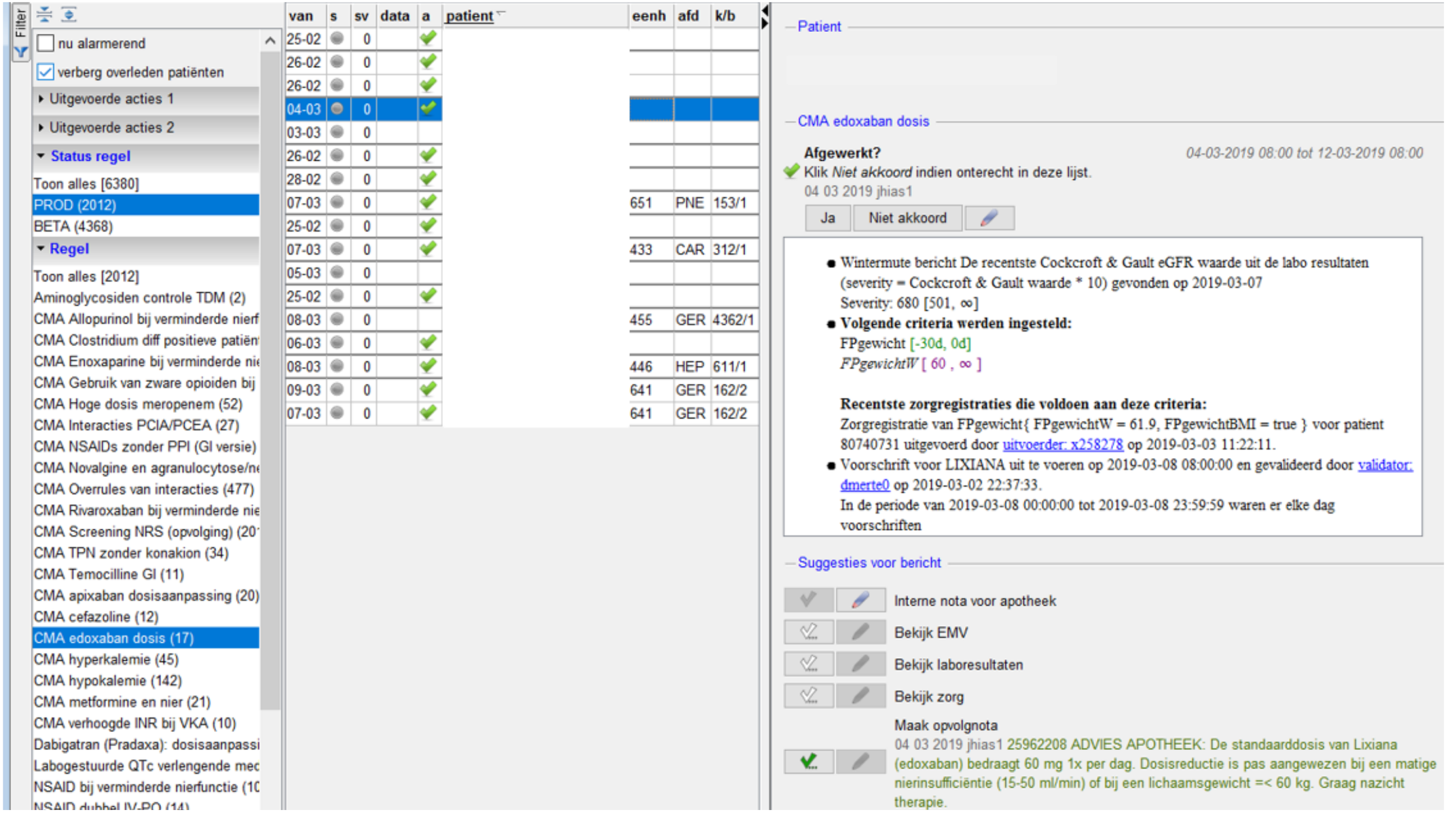
G. Choice of antibiotics per specific indication

- **UTI**
  - FQ vs. amoxiclav?
- **Guidelines?**
  - **Local guidelines**
  - **ESCMID guidelines**

(1) Gupta K, et al. Clin Infect Dis 2011:52(5):e103-120.

How to start? - Close collaboration with IT

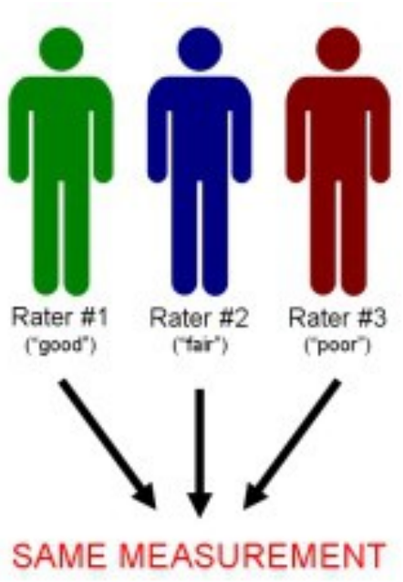
- **Absolute requirement** in the setup of backoffice CMA:
  - **Basic requirements**
    - Medical electronic patient record
    - Electronic prescribing system
  - **Additional tools**
    - Clinical Decision Support Systems (CDSS)
  - **Programming of CMA**
    - Translation of clinical rules into queries
    - Preferably: “all-in-one system”: queries, worklist, electronic notes, acceptance rate…


Filter
nu alarmerend
verberg overleden patiënten
Uitgevoerde acties 1
Uitgevoerde acties 2
Status regel
Toon alles [6380]
PROD (2012)
BETA (4368)
Regel
Toon alles [2012]
Aminoglycosiden controle TDM (2)
CMA Allopurinol bij verminderde nierf
CMA Clostridium diff positieve patiën
CMA Enoxaparine bij verminderde nie
CMA Gebruik van zware opioiden bij
CMA Hoge dosis meropenem (52)
CMA Interacties PCIA/PCEA (27)
CMA NSAIDs zonder PPI (GI versie)
CMA Novalgine en agranulocytose/ne
CMA Overrules van interacties (477)
CMA Rivaroxaban bij verminderde nie
CMA Screening NRS (opvolging) (20
CMA TPN zonder konakion (34)
CMA Temocilline GI (11)
CMA apixaban dosisaanpassing (20)
CMA cefazoline (12)
CMA edoxaban dosis (17)
CMA hyperkalemie (45)
CMA hypokalemie (142)
CMA metformine en nier (21)
CMA verhoogde INR bij VKA (10)
Dabigatran (Pradaxa): dosisaanpassi
Labogestuurde QTc verlengende mec
NSAID bij verminderde nierfunctie (10
NSAID dubbel IV-PO (14)
van s sv data a patient eenh afd k/b
25-02 0
26-02 0
26-02 0
04-03 0
03-03 0
26-02 0
28-02 0
07-03 0 651 PNE 153/1
25-02 0
07-03 0 433 CAR 312/1
05-03 0
25-02 0
08-03 0 455 GER 4362/1
06-03 0
08-03 0 446 HEP 611/1
09-03 0 641 GER 162/2
07-03 0 641 GER 162/2
Patient
CMA edoxaban dosis
Afgewerkt?
04-03-2019 08:00 tot 12-03-2019 08:00
Klik Niet akkoord indien onterecht in deze lijst.
04 03 2019 jhias1
Ja
Niet akkoord
Wintermute bericht De recentste Cockcroft & Gault eGFR waarde uit de labo resultaten (severity = Cockcroft & Gault waarde * 10) gevonden op 2019-03-07
Severity: 680 [501, ∞]
Volgende criteria werden ingesteld:
FPgewicht [-30d, 0d]
FPgewichtW [60 , ∞]
Recentste zorgregistraties die voldoen aan deze criteria:
Zorgregistratie van FPgewicht{ FPgewichtW = 61.9, FPgewichtBMI = true } voor patient 80740731 uitgevoerd door uitvoerder: x258278 op 2019-03-03 11:22:11.
Voorschrift voor LIXIANA uit te voeren op 2019-03-08 08:00:00 en gevalideerd door validator: dmerte0 op 2019-03-02 22:37:33.
In de periode van 2019-03-08 00:00:00 tot 2019-03-08 23:59:59 waren er elke dag voorschriften
Suggesties voor bericht
Interne nota voor apotheek
Bekijk EMV
Bekijk laboresultaten
Bekijk zorg
Maak opvolgnota
04 03 2019 jhias1 25962208 ADVIES APOTHEEK: De standaarddosis van Lixiana (edoxaban) bedraagt 60 mg 1x per dag. Dosisreductie is pas aangewezen bij een matige nierinsufficiëntie (15-50 ml/min) of bij een lichaamsgewicht =< 60 kg. Graag nazicht therapie.

How to start? - Implementation of service

- **Education of clinical pharmacists**
  - Start-up training for all pharmacists
  - Continuous learning and retraining of new guidelines
  - E-learning modules

  - > 20 pharmacists are participating in CMA→ inter-pharmacist variability?
    - ➔ Interrater reliability



How to start? – Follow-up of service

- **Registration of interventions & acceptance rate**
  - Traceability
  - Continuous documentation of impact of CMA
    - Hospital Board
    - Accreditation
  - Evaluation & optimization

“CMA-ABS care bundle”

- Set of 39 clinical rules – grouped per indicator listed in the IDSA guidelines

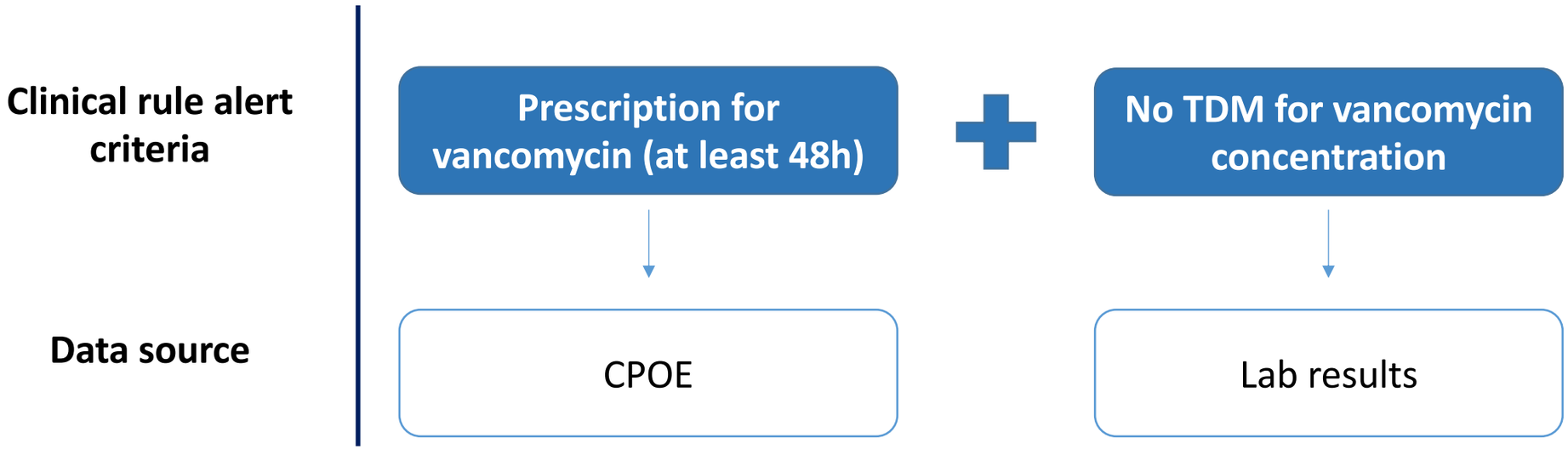
Indicator 1 *~ Start antimicrobial therapy in accordance with local practical guidelines*
E.g. restrictive use high dose meropenem, linezolid, colistin, thiamphenicol, fidaxo, …
Indicator 2 *~ Deprescribing of broad spectrum antibiotic therapy*
E.g. de-escalation of meropenem
Indicator 3 *~ Antimicrobial dose adjustments based on renal function*
Indicator 4 *~ IV to oral switch for bio-equivalent antimicrobial drugs*
Bio-equivalent antimicrobial drugs: moxifloxacin, clarithromycin, clindamycin, cotrimoxazole, rifampin, levofloxacin, linezolid, fluconazole, metronidazole, ornidazole.
Indicator 5 *~ Therapeutic Drug Monitoring (TDM)*
E.g. do TDM vanco, vori, posa, …
Indicator 6 *~ Check for biochemical changes related to antimicrobial drug use*
E.g. K < 3.5 mmol/L and treatment with piperacillin/tazobactam E.g. HAGMA and treatment with high-dose flucloxacillin
Indicator 7 *~ Check for drug-drug interactions with antimicrobials*
E.g. combined use of itraconazole capsules and AST E.g. interactions with rifampin

[1]*Barlam TF, et al. Clin Infect Dis 2016.*

Translating clinical rules into queries: examples

TDM antibiotics

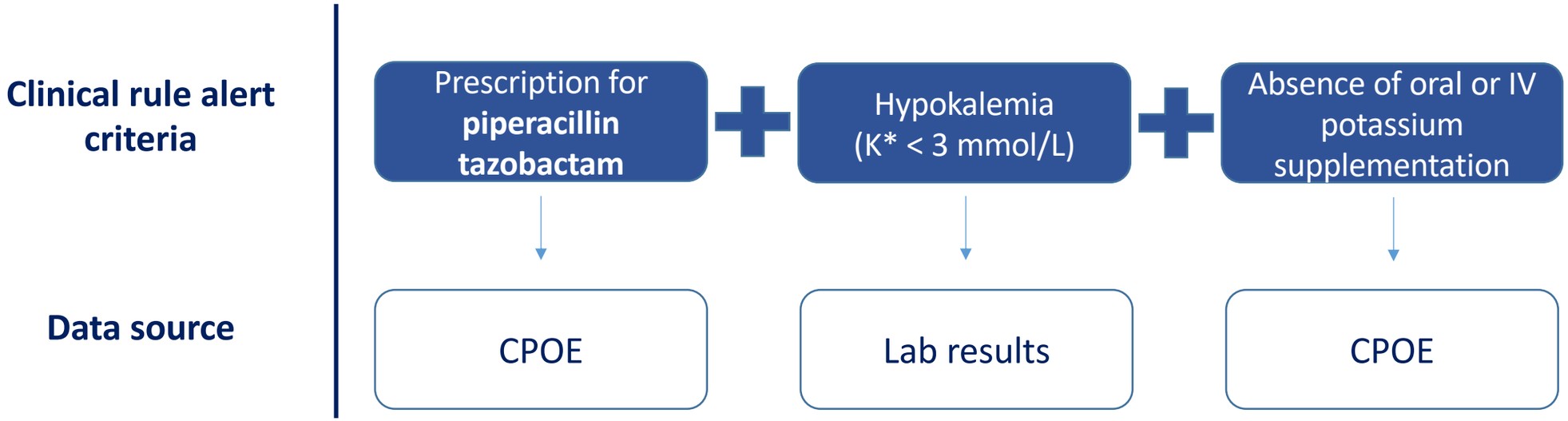
Example: screening for absence of blood monitoring for vancomycin



Translating clinical rules into queries: examples

Drug related biochemical changes

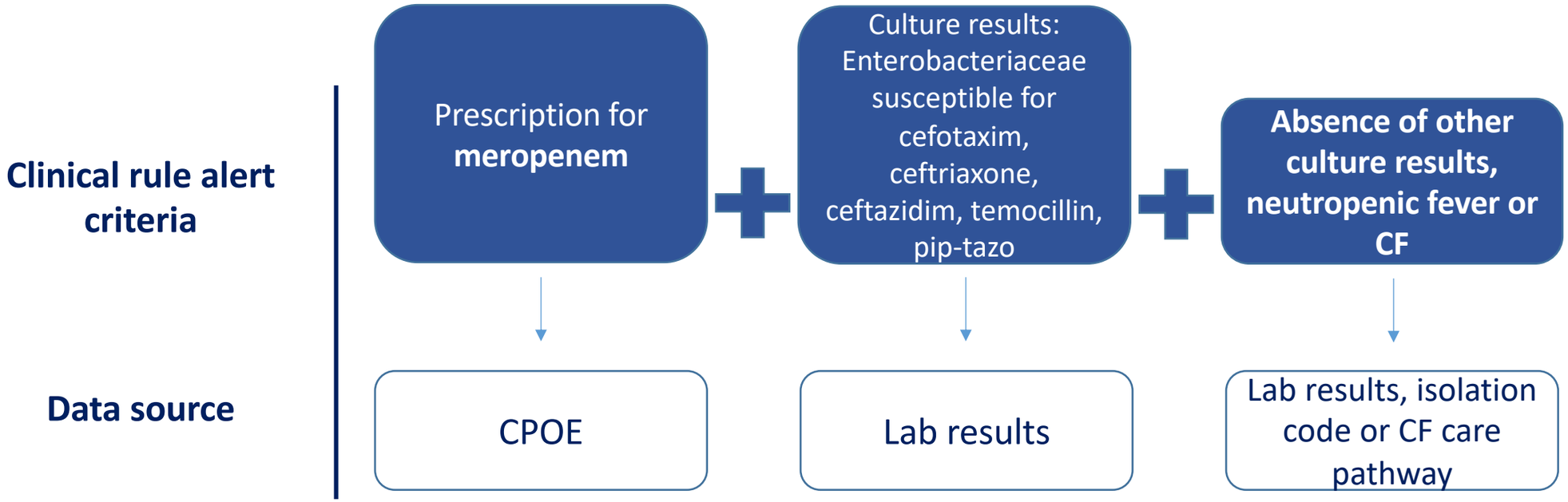
Example: screening for hypokalemia in patients treated with piptazo



Translating clinical rules into queries: examples

De-escalation of broad spectrum antibiotics

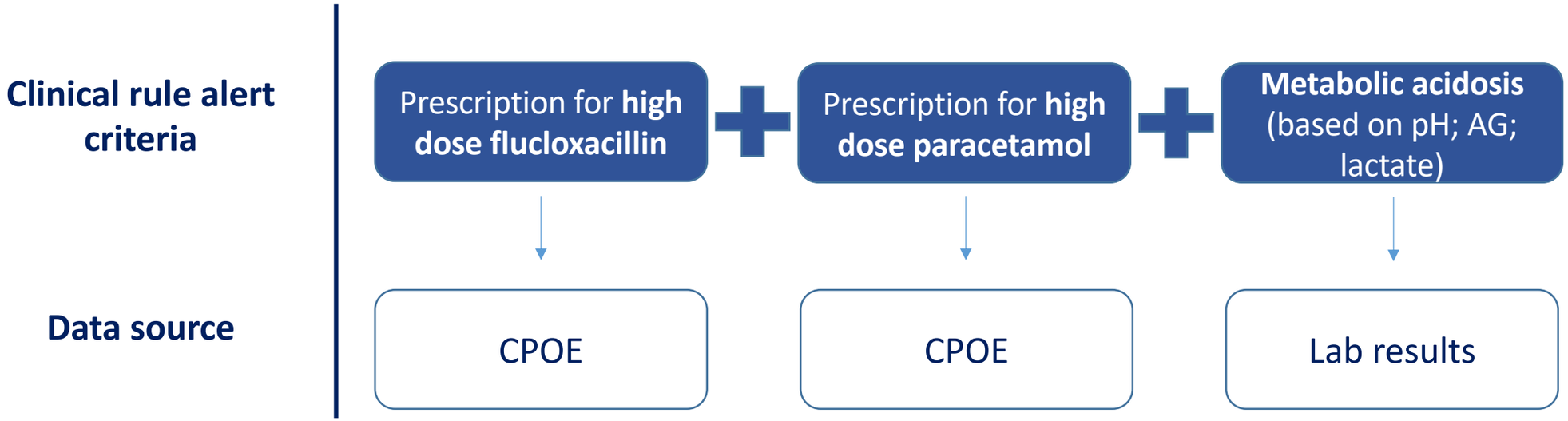
Example: screening for potential de-escalation of meropenem



Translating clinical rules into queries: examples

Drug related biochemical changes

Example: screening for HAGMA induced by flucloxacillin



Preliminary results

November 2018 – July 2019 (10 months)

Pharmacotherapeutic bundle	Number of clinical rules implemented	Number of alerts	Actions provided by pharmacists	Acceptance rate by physicians
ABS	36/39	4 363	776	72,91 %
ACS	9	4 835	634	68,64 %
PSP	13	10 737	1 093	72,50 %
Varia	8	10 871	1 083	71,36 %
Total	**66**	**30 806**	**3 586**	**71,57 %**

17,8%

CMA - strenghts

- **Patient-oriented hospital-wide** pharmacy service
- Maximum **integration of structured data** from patient file
- Covering a wide range of **pharmacotherapeutic aspects**
- **CMA = pharmacist-based decision support system → avoiding alert fatigue (among physicians)** by providing alerts aiming exclusively at hospital pharmacists

CMA: limitations

- **Clinical review** by (all) hospital pharmacists → education + interrater reliability

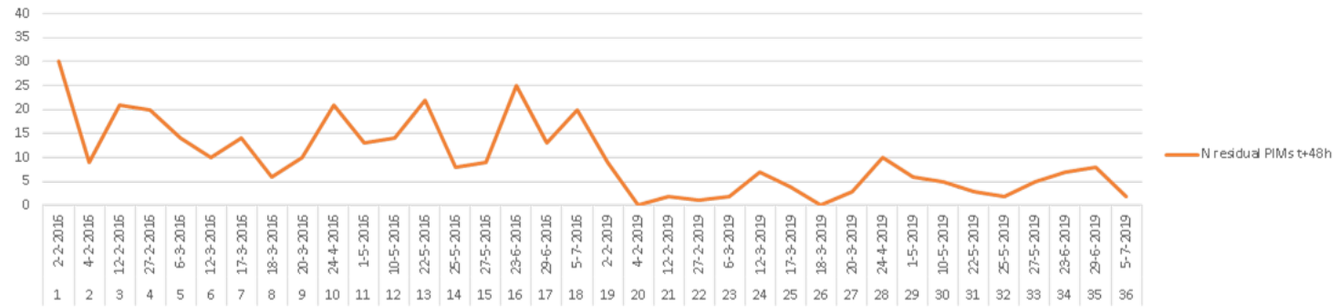
- **Specificity (and sensitivity)** of screening dependent on:
  - The extent of **digitalization/structured log** of patient characteristics in EHR
  - The extent of **communication** between different information systems

CMA: future perspectives

- **Increasing specificity and sensitivity**

- **Controlled ITS analysis** to evaluate clinical impact

  → Systematically re-evaluating the service, including all clinical rules



- Focusing on **other pharmacotherapeutic domains**

  → Oral chemotherapy, polypharmacy in the elderly, TDM other drugs…

Take home messages

1. CMA is a **liaison between CDSS and (in our case, limited) bedside clinical pharmacy**

2. Screen for prescriptions with a high risk of **drug related problems**

3. Clinical input for the validation service needs to be based on
   - **(Inter)national guidelines**
   - **Gained bedside knowledge**
   - **Local patient safety incident reports**
   - **Expert opinions**

4. Hospital-wide support is essential (hospital board, IT, P&T, experts…)

Take home messages

5. CMA contributes provides pharmacotherapeutic support in ABS

6. ABS is enhanced by the computer (and the clinical pharmacist)