GSASA «digital» 2020 CONGRESS GENERAL ASSEMBLY

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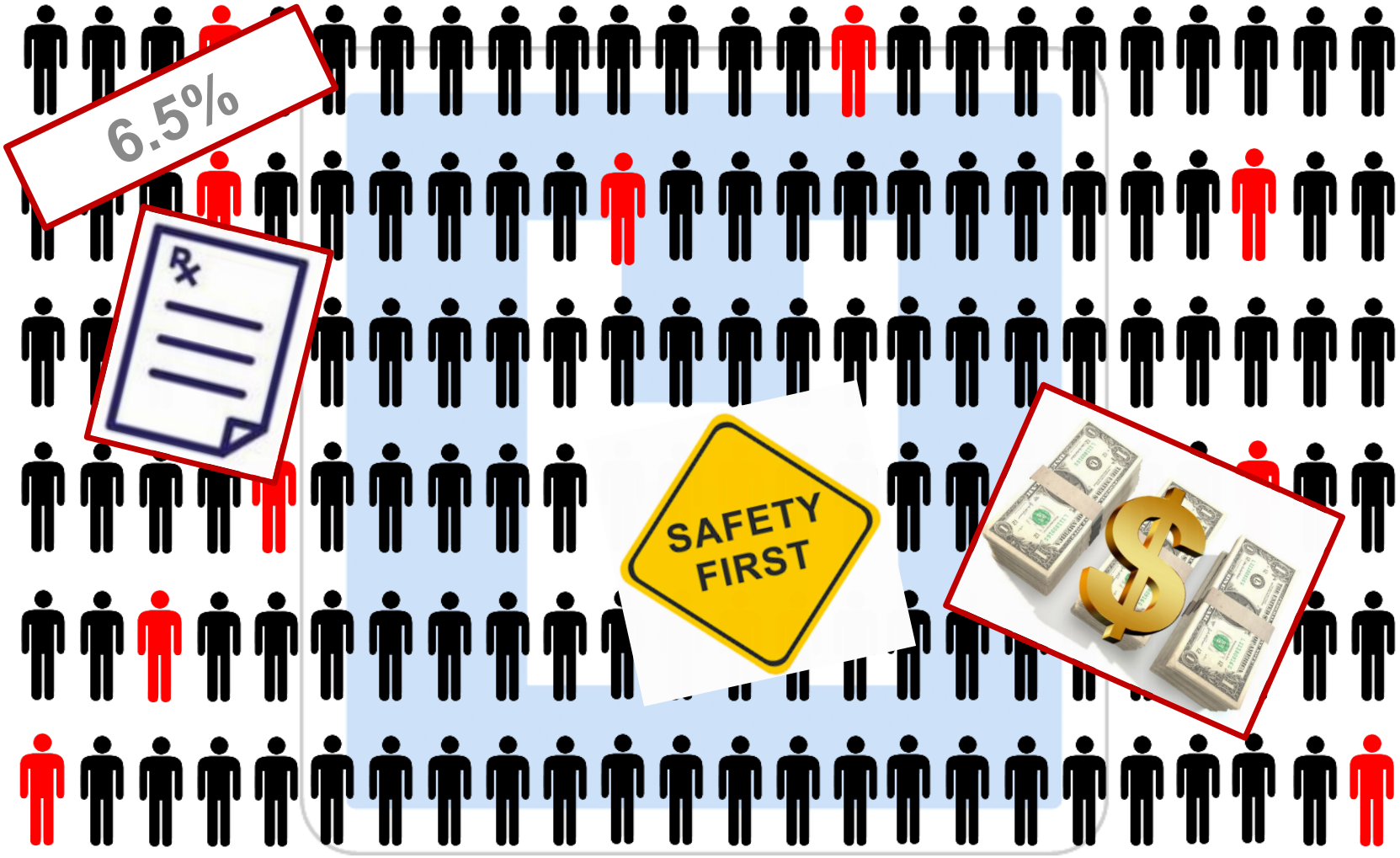
Risikobasiertes Screening von Patienten mit arzneimittelbedingten Problemen

Vera Jordan-von Gunten

GSASA Digital Congress
Basel, 26. November 2020

Context in hospitals

Adverse drug events



Forster AJ. J Am Med Inform Assoc. 2012; Lazarou J. JAMA. 1998; Classen DC, JAMA. 1997; Howard RL. Qual Saf Health Care. 2003; Formica D. Expert Opin Drug Saf. 2018:

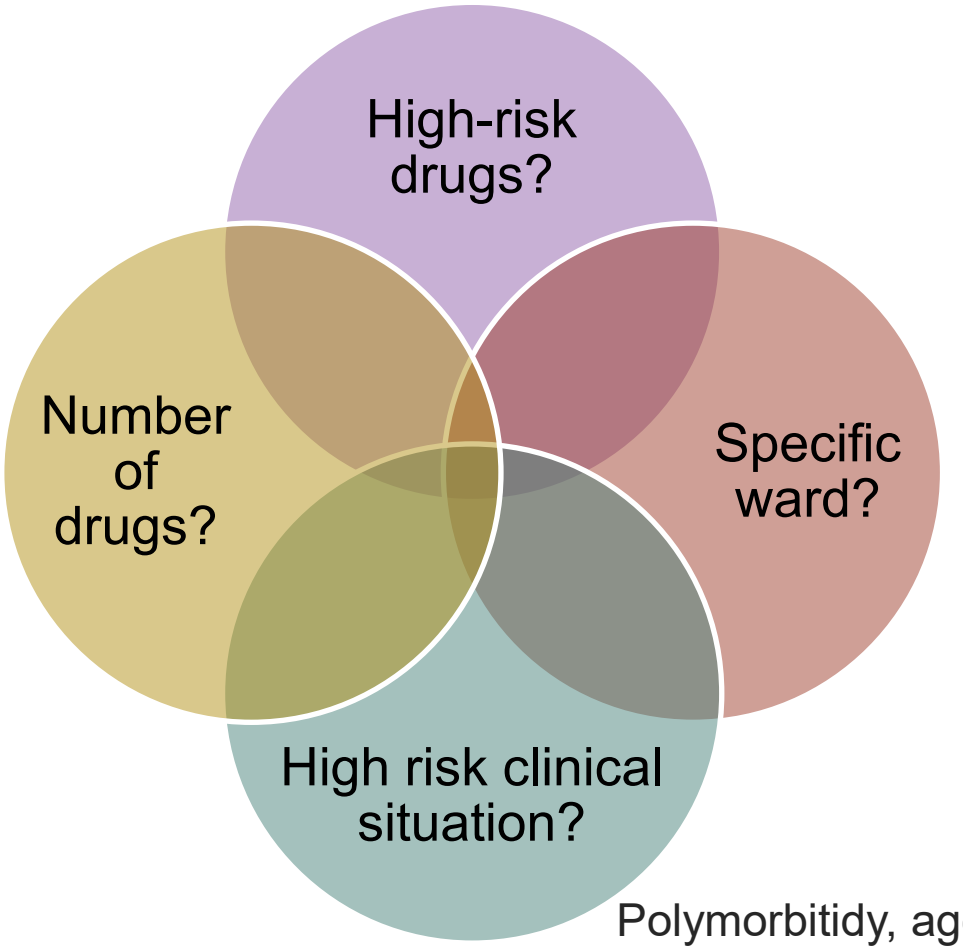
How can we assess that drug are used safely?

- Pharmacist has proven his role in identification and prevention of Drug Related Problems
- Improved medication use and patient outcome

- ↑ Nb of prescriptions,
- ↑ Nb of patients,
- ↑ Complexity of patients,
- Multimorbidity/Polypharmacy
- Limited resources

PRIORITIZATION TOOLS
TARGETING THE RIGHT PATIENTS

Who are the right patients?



Polymorbitidy, age, disability, organ failure?

Patient prioritization

Editorial Lewis P. Eur J Hosp Pharm 2017;**24**:314.

Drugs - Real World Outcomes (2016) 3:241–263
DOI 10.1007/s40801-016-0083-4

CrossMark

SYSTEMATIC REVIEW

Risk
Inter
of the

Emma S

Published

ELSEVIER

Research in Social and Administrative Pharmacy
Volume 15, Issue 6, June 2019, Pages 767-779

Patient prioritization for pharmaceutical care in hospital: A systematic review of assessment tools

Meshal A. Alshakrah, Douglas T. Steinke, Penny J. Lewis

Show more

https://doi.org/10.1016/j.sapharm.2018.09.009

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Patient prioritization : identified risk factors

19 studies evaluating 17 tools

Risk factors (patient related) :
- Age
- Renal impairment
- Comorbidity

Risk factors (drug related) :
- High risk medication
- Drugs requiring monitoring
- Polypharmacy

High risk drug classes:
- Anticoagulants
- Cardiovascular
- Antiepileptic drugs
- Antimicrobials
- Chemotherapy
- Immunosuppressants
- Insulin
- Opiates

Alshakrah MA, Steinke DT, Lewis PJ, Patient prioritization for pharmaceutical care in hospital: A systematic review of assessment tools, *Research in Social & Administrative Pharmacy* (2018), doi: https://doi.org/10.1016/j.sapharm.2018.09.009.

Patient prioritization

ARTICLE IN PRESS

Research in Social and Administrative Pharmacy xxx (xxxx) xxx

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Prognostic prediction models and clinical tools based on consensus to support patient prioritization for clinical pharmacy services in hospitals: A scoping review

Stephanie Ferreira Botelho [a], Laís Lessa Neiva Pantuzza [a], Claudyane Pinheiro Marinho [b], Adriano Max Moreira Reis [a,*]

Identification of most frequent risk factors included in clinical prioritization tools to identify patients at risk of adverse medication-related outcomes in hospitalized patients

Botelho SF, *Research in Social & Administrative Pharmacy* (Article in Press, August 2020), doi: https://doi.org/10.1016/j.sapharm.2020.08.002

Patient prioritization

Medication

Anticoagulants/direct oral anticoagulants
Corticosteroids
Epilepsy medicines
High risk medicine
Insulin
Narrow therapeutic index
Number of medications
Opiates

Process

Medication profile have not been updated previous 72 hours
Medication that is difficult to handle
Parenteral administration route
Patient considered for home intravenous/out of respiratory service
Patient not understanding the goal of therapy
Patient taking or being considered for a high-cost-medicine (e.g. Posaconazole) that requires alternative funding stream
Patient with Parkinson´s disease on apomorphine pump
Poor adherence medication
Previous adverse drug reactions
Using enteral gastric tube
Using total parenteral nutrition

Clinical and demographic characteristics

Age in years
Diagnosis of chronic heart disease (heart failure, coronary heart disease, arrhythmias)
Diagnosis of chronic respiratory diseases (asthma or chronic obstructive pulmonary disease or cystic fibrosis)
Liver impairment (diagnosis of hepatic impairment and/or chronic hepatitis and /or hepatic cirrhosis; acute liver failure)
Renal impairment (clearance creatinine <60 ml/min or clearance creatinine <30 ml/min or diagnosis of chronic kidney disease or diagnosis of acute kidney injury or creatinine >2.2mg/dl or > 2 times in baseline in past 5 days)

Patient care characteristics

Language issues (i.e., non-native speakers)
Previous hospitalization (prior discharge in previous 30 or 7 days)

Laboratory values

INR > of 3.5 or aPPT of > 100 sec or two consecutive INR values of <1.5 ans/or aPTT of 60sec in past 5 days; Culture positive for presence of toxigenic or C. difficile toxins in past 5 days; Glucose of > 198mg/dl or of < 72 mg /dl in past 5days or HBA1c of >64mmol in past 90 days; Hemoglobin with drop to > 25% or packed cell volume with drop to >25% considering baseline (past 5days) or platelet count of < 50pf 109/L within past 5 days; Serum potassium of <3 or >6 mmol/L in past 5 days; Serum sodium of < 125 or > 155 mmol/L in past 5 days; Troponin values of > 300ng/ml in past 5 days; White blood cell < 3 x103/mm3 or neutrophil count of 1.5 x103/mm^3 in past 5 days.

Und in der Schweiz…

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Detect and prevent drug induced delirium through an algorithm combining anticholinergic burden scales and other risk factors[1]

Identifikation von Patienten für klinisch-pharmazeutische Interventionen am USB[3]

PharmaCheck : intercept high risk situations that could lead to adverse drug events[2]

Und sicher noch viel andere Projekte … ☺

[1] Spital Baden (Lisibach A, Lutters M) : Detection and prevention of delirium triggered by adverse drug events (DELIKT project)

[2]HUG (Skalafouris C et al : Projet PharmaCheck

[3]USB: Definition von unterschiedlich gewichteten Risikofaktoren zur Generierung eines Scores, Generierung einer «Rangliste»

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Hôpital du Valais (HVS)

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Spital Wallis
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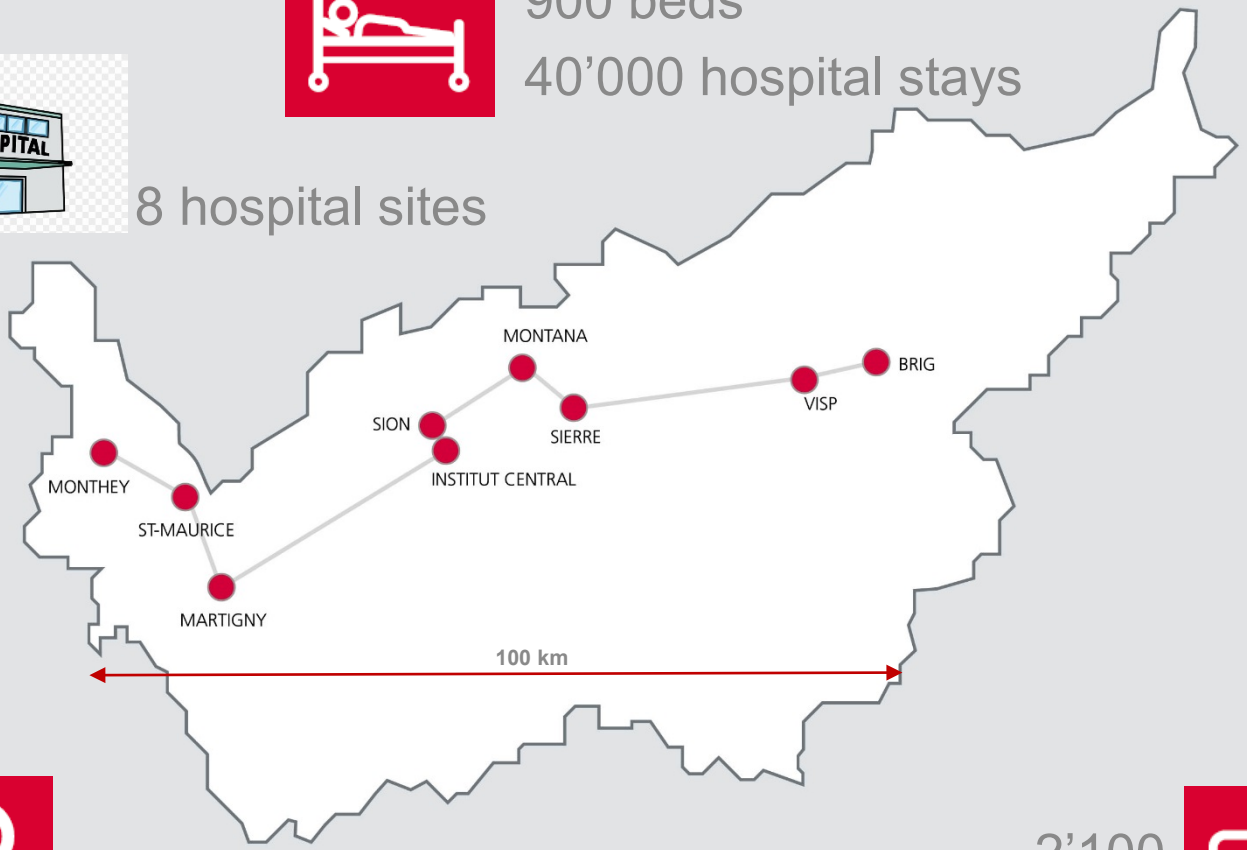
Zentralinstitut der Spitäler

900 beds
40’000 hospital stays

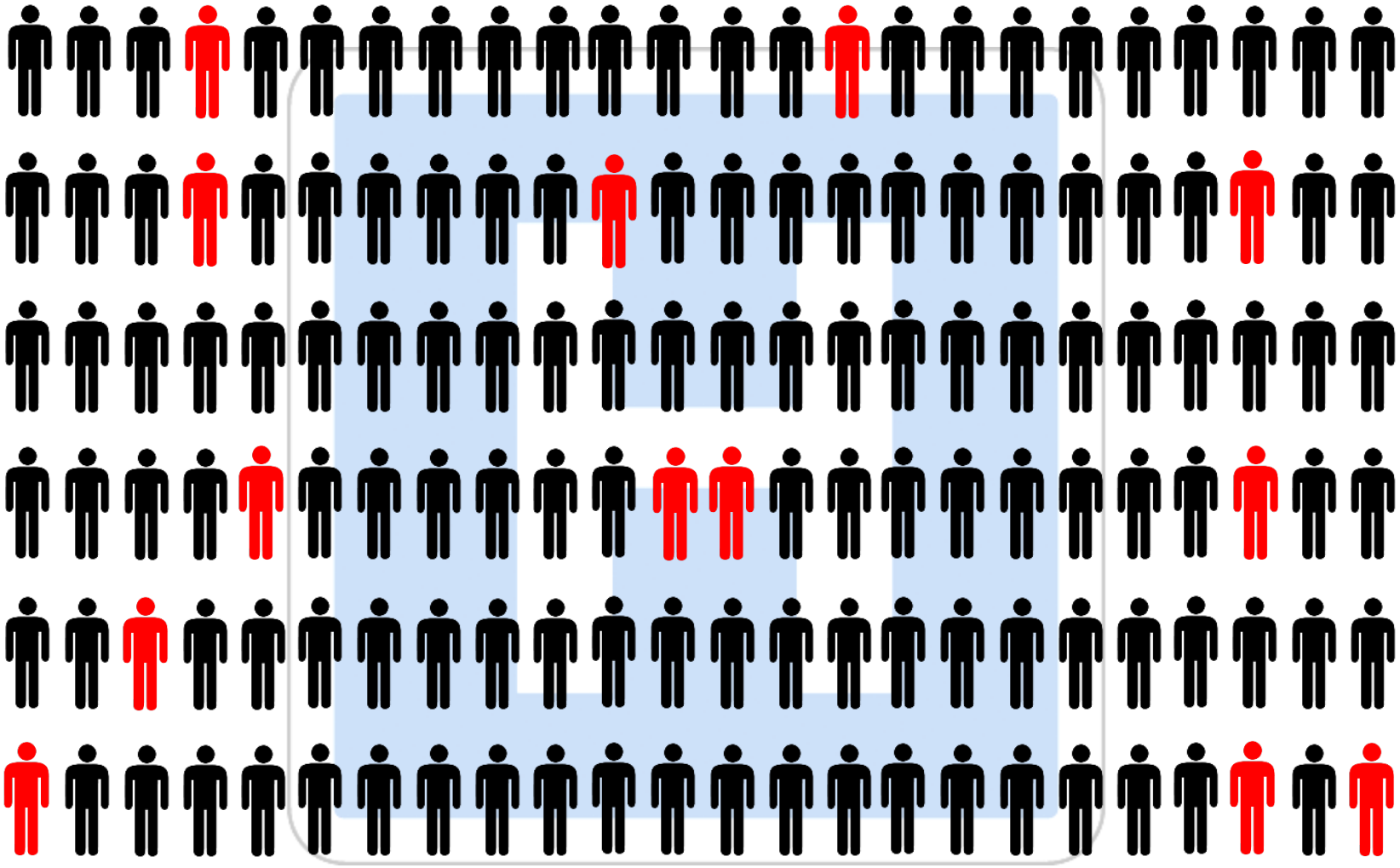
8 hospital sites



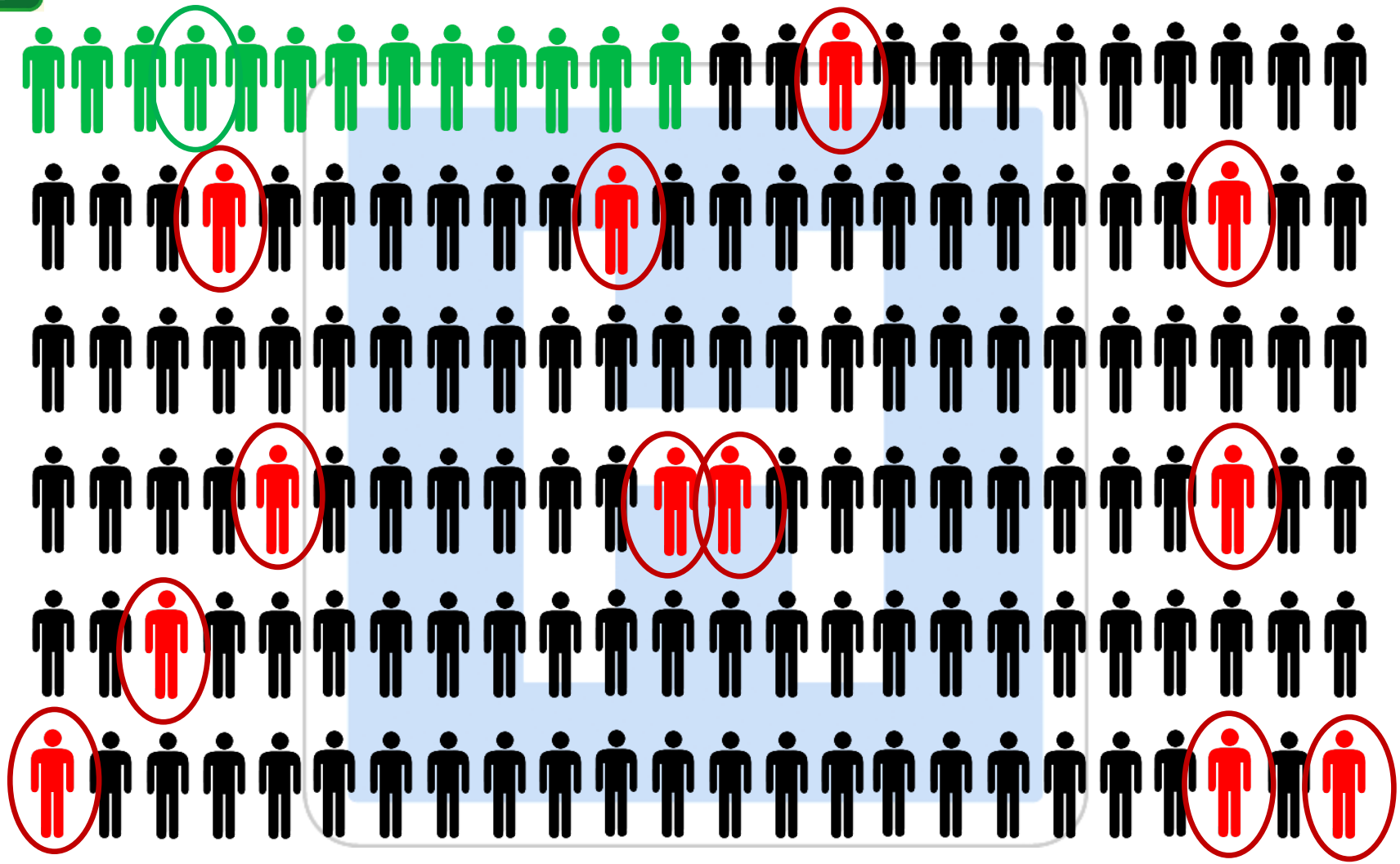
10 pharmacists with clinical activities

2’100 prescriptions/day

High risk patients…



… and pharmacy staffing



1st screening tool 2008

- In 2008, 1st version of the electronic screening tool in our pharmacy
- Screening with 6 algorithms (ATC Codes ± lab values)
- Aim: gain time to prepare clinical rounds
- Sensitivity 85%, Specificity 60.4%
- Too complicated to run on a daily basis

Pharm World Sci
DOI 10.1007/s11096-009-9352-6

RESEARCH ARTICLE

Electronic screening of medical records to detect inpatients at risk of drug-related problems

Isabelle Roten · Stefan Marty · Johnny Beney

Roten I(1), Marty S, Beney J. Electronic screening of medical records to detect inpatients at risk of drug-related problems. Pharm World Sci. 2010 Feb;32(1):103-7.

2nd screening tool (2018)

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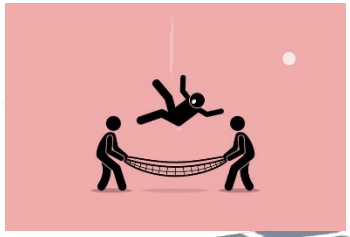
Aim of the MediScreen project

Running

All patients of HVS (daily)

High criticality alerts



Allows screening of high risk situations and prescription validation

In progress

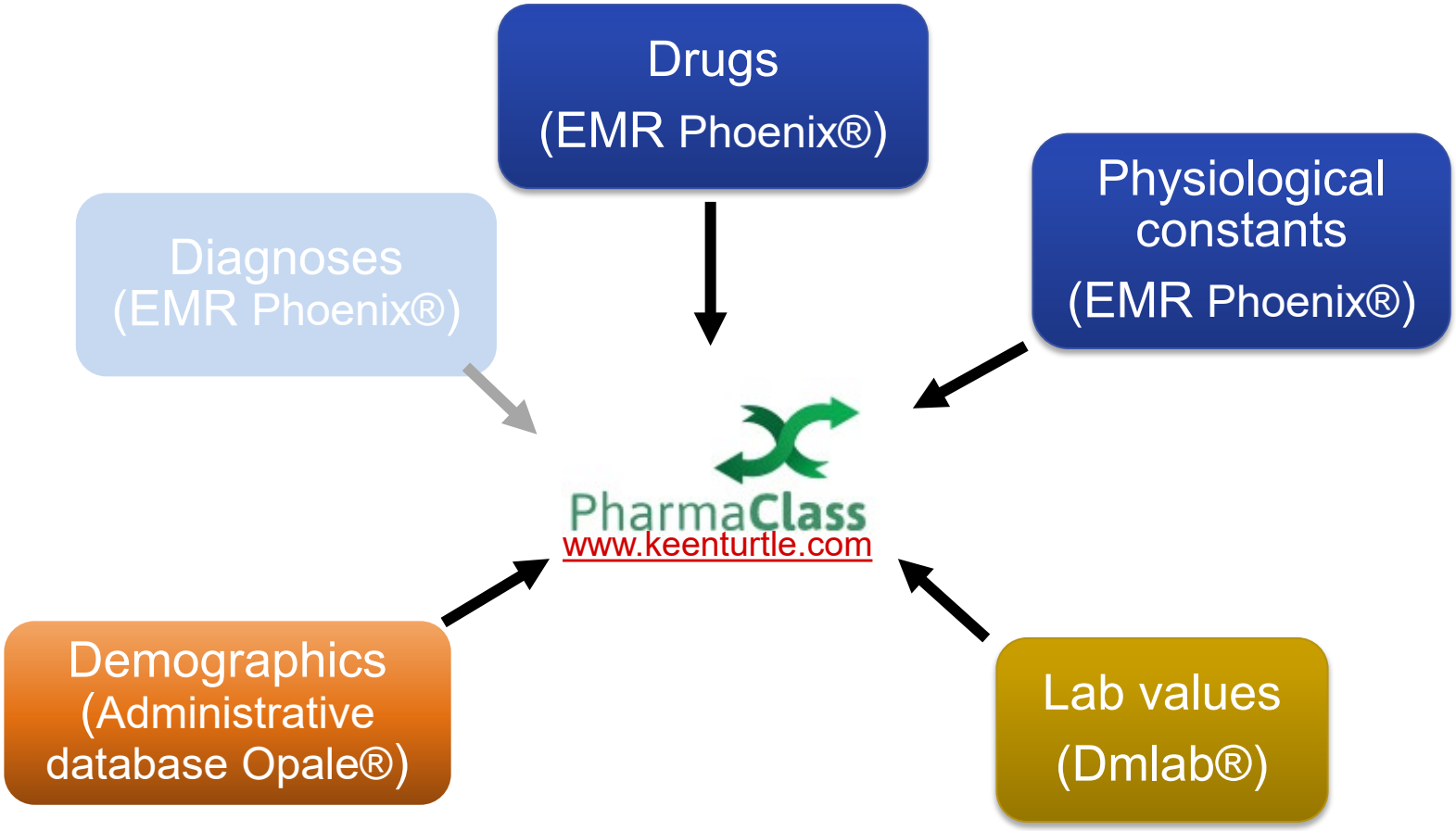
Patients seen during ward rounds (5-10%)

medium criticality alerts

Allows rapid identification of patients on the selected ward

Bochatay L, Jordan-von Gunten V, Turini P, Beney J. MediScreen: Détection de patients à risque d'événements indésirables médicamenteux: élaboration de règles pour les dossiers patients informatisés; Oral communication and poster, JFSPH, Belfort, mars 2018. https://www.hopitalvs.ch/fr/professionnels-de-la-sante/institut-central-des-hopitaux/pharmacie/documentation.html

… Data from the EMR



Prioritization and validation of queries

86 queries retrieved from literature search

Prioritization by project team

High criticality

25 queries, validated by medical panel

Medium criticality

75 queries, validation by pharmacists

Bochatay L. et al. Outils de détection de prescriptions inadéquates : revue de la littérature et formulation de règles informatisables. *Soumis à La Presse Médicale, 8 avril 2020*

Different types of alerts: high risk drugs

High-risk drugs → identifies only the presence of a drug → need to check several parameters in medical record that cannot be extracted electronically

Presence of the following drug:

- Colchicine
- Methotre
- Drugs ca
- Immunos
- Mysoline

Check-list for Methotrexate :

- Indication (do not consider if used for chemotherapy)
- Control several lab values (ASAT, ALAT, Bilirubin, albumin, Hemoglobin, WBC, platelets, renal function)
- Perform interaction check
- Check for signs of toxicity (diarrhea, stomatitis, abdominal pain, infections, …)

Different types of alerts: potential DRPs

Potential DRP → combination of parameters → need to validate if DRP is clinically relevant

Altered renal function (eGFR depending on drug) with:

- Colchicine
- Levetiracetam
- Methotrexate
- Metformin
- Morphin
- Direct Thrombin inhibitor
- Direct Factor Xa inhibitor

Different types of alerts: potential DRPs

Potential DRP → combination of parameters → need to validate if DRP is clinically relevant

Combination of 2 oral anticoagulants

Combination of azathioprine/mercatopurin and febuxostat/allopurinol

Combination of clozapine and carbamazepine

Digoxin and K+ out of range

Digoxin and Digoxin-level > range

Vancomycin and Vancomycin-level < 10mg/L or > 20mg/L

Check-list for Vancomycin and level :

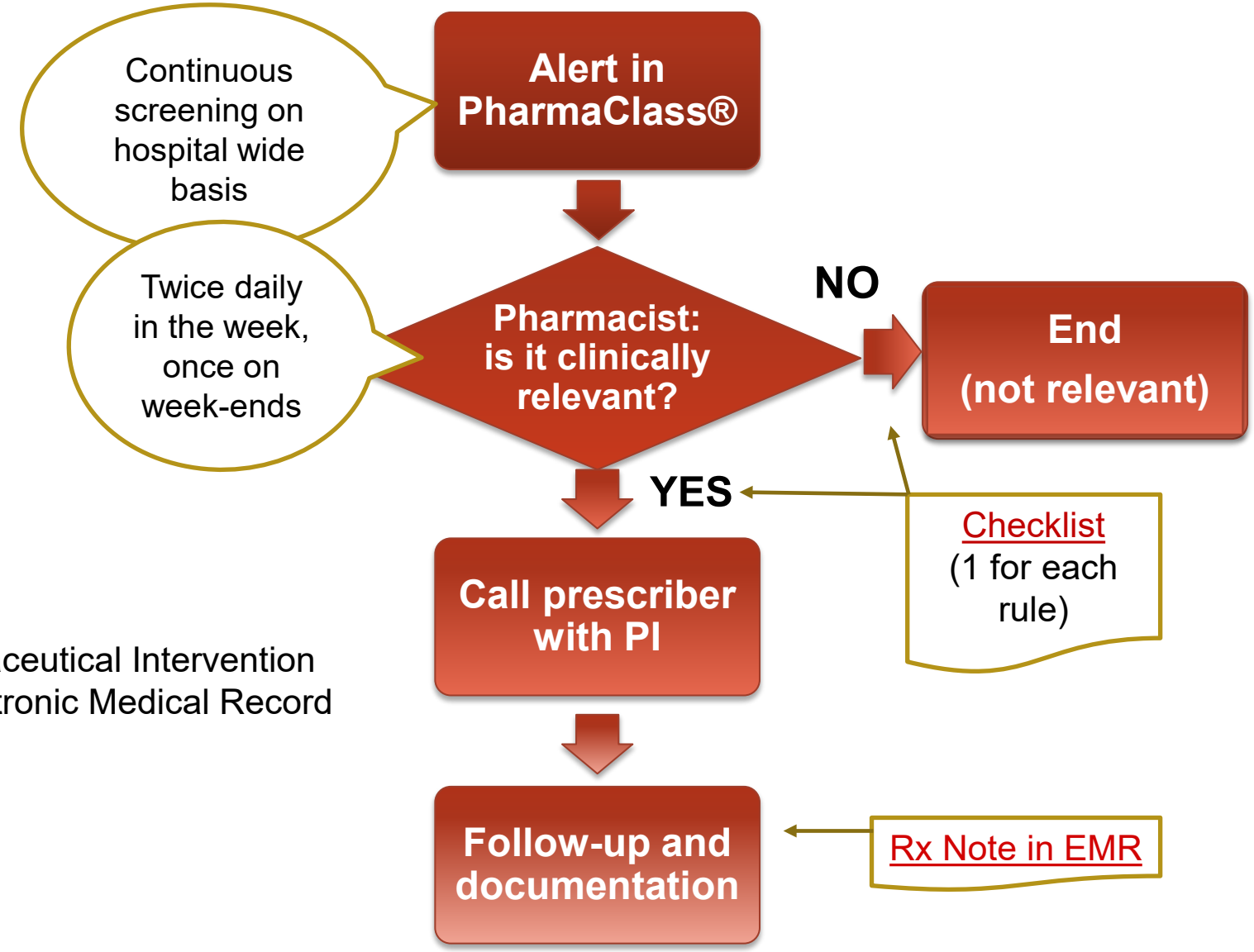
- Check pre-analytical aspects (timing of level)
- Check renal function
- If necessary, suggest new vancomycin dose regimen

Different types of alerts: antibiotic stewardship

Antibiotic Stewardship → 1 specific antibiotic prescribed for several days → transfer to Infectious Diseases team

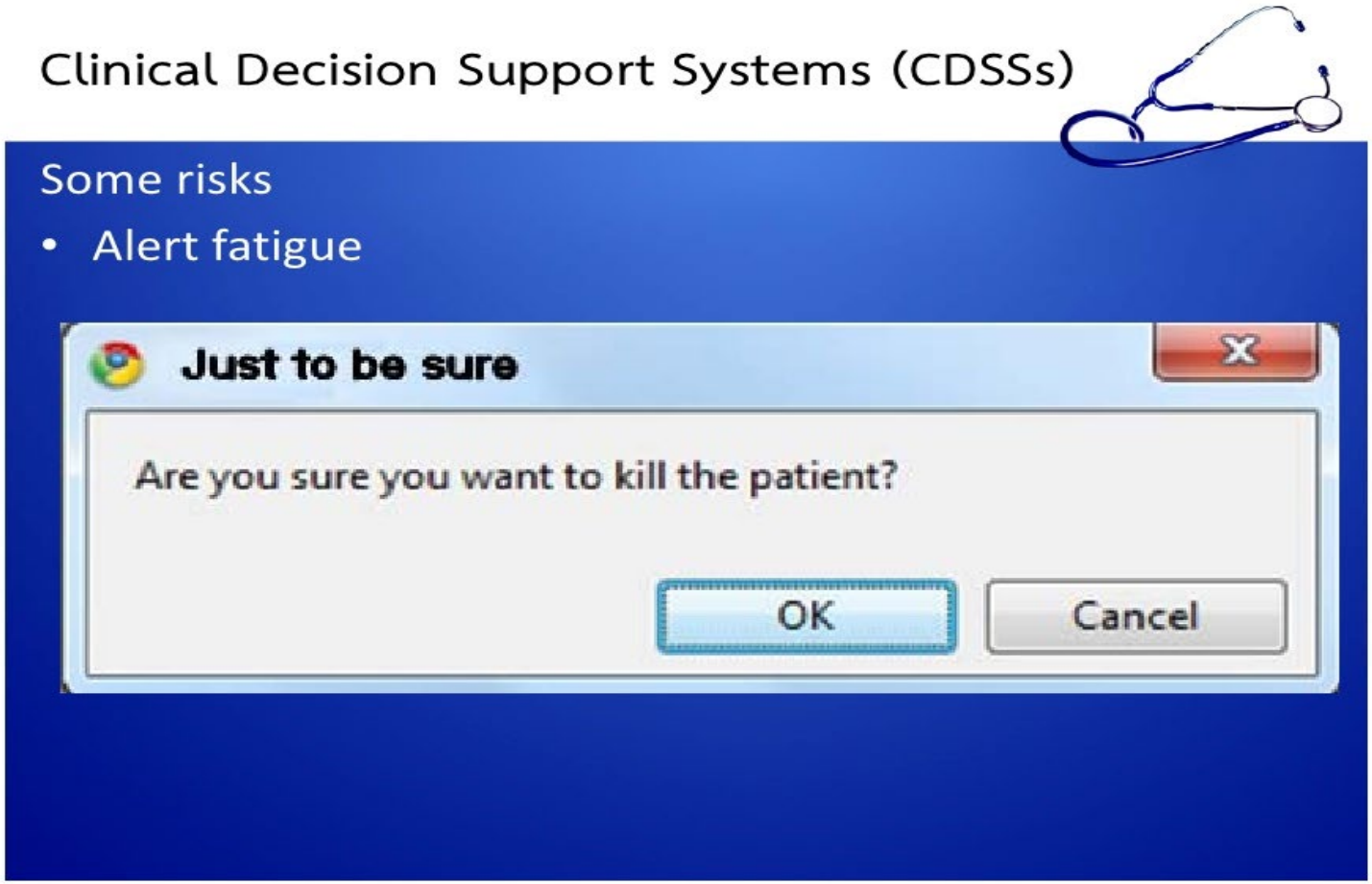
Meropenem > 3 days
Pip/tazo > 3 day
… more to come…
Antifungals..
Antivirals..
Reserve drugs…

How it works



PI : Pharmaceutical Intervention
EMR : Electronic Medical Record

Why do the alerts go to the pharmacists ?



https://psnet.ahrq.gov/primers/primer/28/alert-fatigue (accès le 30.08.2019)

Indicators (nov. 2019 – oct. 2020)

12 risk situations analyzed

PPV : 10%

1.15 Pharmacist Intervention of high criticality

1h40 of Pharmacist's time spent

83% of PI leading to a treatment modification

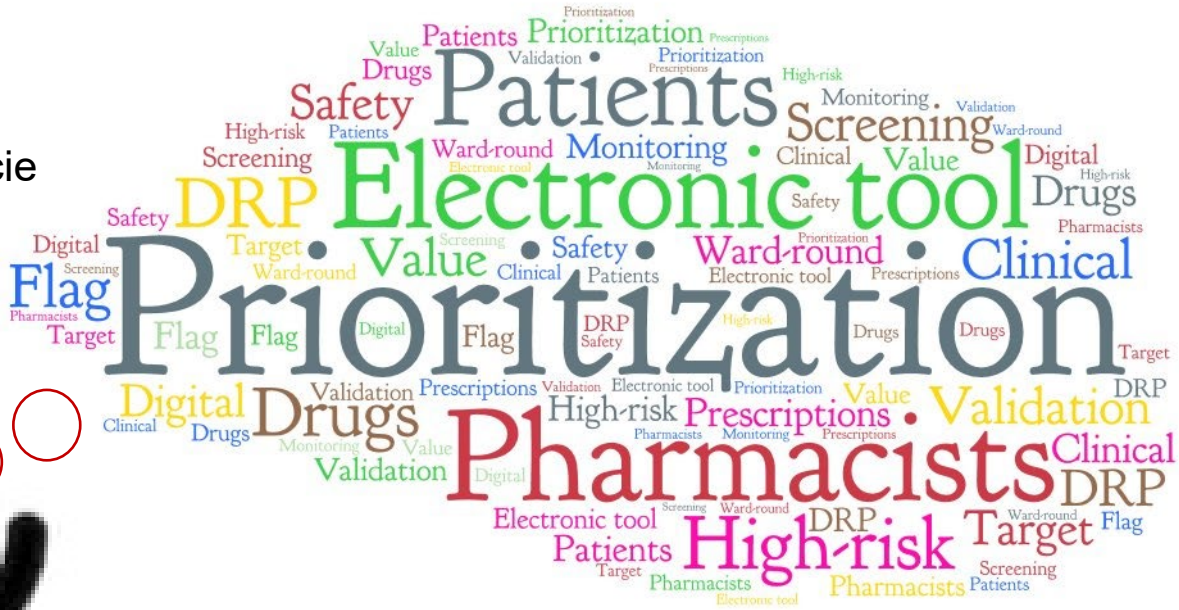
n = 3335 Meldungen

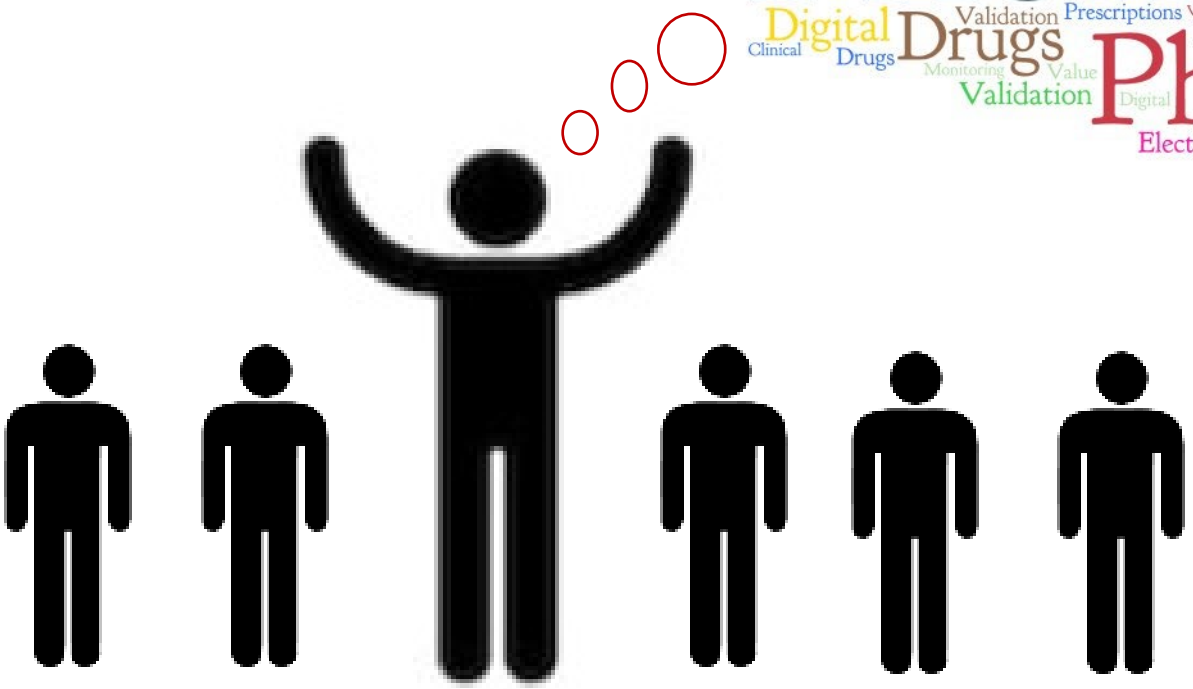
Is electronic screening Helpful or Harmful?

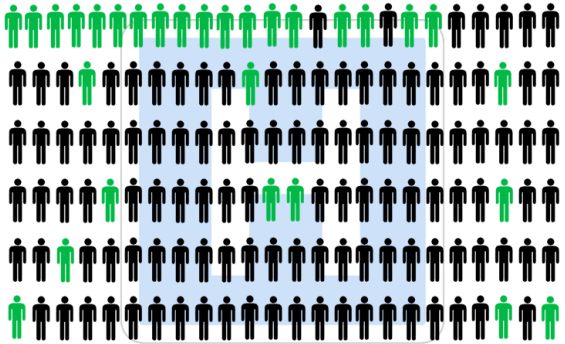
	HELPFUL	HARMFUL
INTERNAL	Strengths : - Coverage of more patients - Surveillance of high-risk drugs / clinical situations - Deployment of clinical pharmacy - More efficient preparation of ward rounds	Weaknesses : - Limitations of IT tools, interfacing - Depends on quality of documentation - Rx & IT time for system maintenance - Needs rules with high PPV
EXTERNAL	Opportunities : - Drug use evaluations - ATB stewardship - Follow-up of high-cost drugs - National and international collaboration -	Threats : - Failures/crashes of the information systems - Pharmacist accountability - Loss of interprofessionnal relationship ?

Thank you !

Tous les collègues de la pharmacie
ICH ☺







vera.vongunten@hopitalvs.ch

ANY QUESTIONS?

Etat de la situation (nov 2020)

- **Avons essentiellement continué à travailler sur les criticité élevée**
- **Avons résolu 2 pannes importantes, identifié des faux négatifs, corrigé des alertes**
- **Criticité moyenne: nous avions 75 alertes qui nous paraissaient intéressantes en 2018**
  - En cours de révision quant à la pertinence clinique (actuellement 22 validées par les pharmaciens cliniciens)
  - Décrire la conduite à tenir
  - Les mettre en production
- **Avons utilisé le système pour plusieurs besoins**
  - Pandémie: alertes hydroxycholoroquine / Kaletra avec conduite à tenir et suivi des patients sur 5j
  - Valproate et femme de < 50ans
  - Évaluations pour la Commed (basées sur prescription de médicaments, plutôt que livraisons)

Patient prioritization : electronic tools

- **Roten** I, Marty S, Beney J. Electronic screening of medical records to detect inpatients at risk of drug-related problems. *Pharm World Sci*. 2010;32:103–107. http://dx.doi.org/10.1007/s11096-009-9352-6
- **Hickson** RP, Steinke DT, Skitterall C, Williams SD. Evaluation of a pharmaceutical assessment screening tool to measure patient acuity and prioritise pharmaceutical care in a UK hospital. *Eur J Hosp Pharm*. 2016;24:74–79.
- **Carlson** MK, Phelps PK. Use of an electronic clinical scoring system to prioritize patients' medication-monitoring needs. *Am J Heal Pharm*. 2015;72:2032–2038. http://dx.doi.org/10.2146/ajhp140827
- **Cottrell** R, Caldwell M, Jardine G. Developing and implementing a pharmacy risk screening tool. *Hosp Pharm Eur*. 2013;71.
- **Falconer** N, Nand S, Liow D, Jackson A, Seddon M. Development of an electronic patient prioritization tool for clinical pharmacist interventions. *Am J Heal Pharm*. 2014;71:311–320. http://dx.doi.org/10.2146/ajhp130247
- **Jeon** N, Staley B, Johns T, Lipori GP, Brumback B, Segal R, Winterstein AG. Identifying and characterizing preventable adverse drug events for prioritizing pharmacist intervention in hospitals. *Am J Health Syst Pharm*. 2017;74:1774–1783.
- **Mullan** N, Jennings A. Pharmacists' Use and Views of the Electronic Prescribing Web Portal. Paper presented at GHP/UKCPA 9th National Joint Conference, Harrogate, UK; 2013.
- **Munday** A, Forrest R. New Ways Of Pharmacy Team Working Within Acute Hospital Services in NHS Greater Glasgow & Clyde. *J Pharm Manag*. 2016;32:84–87.
- **Nguyen** T-L, Leguelinel-Blache G, Kinowski J-M, Roux-Marson C, Rougier M, Spence J, Le Manach Y, Landais P. Improving medication safety: Development and impact of a multivariate model-based strategy to target high-risk patients. *PLoS One*. 631 2017;12:e0171995.
- **Safadeh** M, Pazik L KR. A baseline assessment of the pharmaceutical needs of adult patients admitted to Stoke Mandeville Hospital. *Clin Pharm 2012*. 2012:S36–S38.

Alshakrah MA, *Research in Social & Administrative Pharmacy* (2018), doi: https://doi.org/10.1016/j.sapharm.2018.09.009.

Prescription de Méthotrexate

DESCRIPTION:
Afin d'évaluer les effets indésirables et les interactions possibles

CONDUITE A TENIR:

- Vérifier l'indication
- Contrôler les transaminases hépatiques (ALAT, ASAT PAL, albumine, bilirubine), la numération sanguine (Hb, leucocytes, thrombocytes) et la fonction rénale *(NB: autre alerte pour MTX et fonction rénale <80ml/min).*
- Faire un check d'IA
- EI: réactions hématologiques (leucopénie, thrombopénie, anémie macrocytaire) et gastro-intestinales (stomatite, nausées, douleurs abdominales, diarrhées, hémorragies digestives), pneumonie, nodules rhumatoïdes/exanthème, infections, alopécie

Bibliographie:
Monitoring toutes les 2 à 4 semaines pendant 3 mois, puis toutes les 8 à 12 semaines pendant les 3 mois suivants, puis toutes les 12 semaines. Plus fréquemment en cas d'association avec un autre médicament hépatotoxique ou hématotoxique.

Interactions:
Aplasie médullaire: sulfamide antibactérien, triméthoprime, hydantoïne, dérivés des pyrazolés, chloramphénicol, sulfonylurées (déplacent le MTX de sa liaison avec l'albumine et augmente sa concentration plasmatique libre.
Interactions possibles avec les barbituriques, les tranquillisants, les tétracyclines, le furosémide, le probénécide et les anti-inflammatoires non-stéroïdiens.

www.swissmedicinfo.ch
https://www.rheuma-net.ch/fr/informations-d-experts/recommandations-traitement
PIM Check N° 67

Prescription de vancomycine et taux résiduel de vancomycine hors norme

DESCRIPTION:
Prescription de vancomycine et taux résiduel hors norme (<10mg/L ou >20mg/L)

CONDUITE A TENIR:

- Vérifier la pré-analytique
- Vérifier la fonction rénale (chez l'insuffisant rénal, la demi-vie est allongée). Considérer une amélioration ou une péjoration de la fonction rénale pour l'ajustement de dose.
- En fonction du taux: proposer des adaptations de dose/intervalle ou rappeler au médecin de le faire:
  - L'ajustement de la vancomycine n'est pas une science exacte, et les nomogrammes sont à titre indicatif
  - La vancomycine a une PK linéaire: doubler la dose pour doubler le taux; si la fonction rénale est stable

Use the following proportion equation to estimate the required daily vancomycin dose to attain the desired trough (or random level if on continuous infusion)

- Divide estimated daily vancomycin dose every 8 to 12 hours and round to the nearest 250 mg

$$\frac{\text{Current daily vanc dose}}{\text{Current trough level}} = \frac{\text{Estimated daily vanc dose}}{\text{Desired trough level}}$$

- Example: Patient is on 1g every 12 hrs with a trough of 10mcg/mL. My desired trough is 15 mcg/mL. What is the recommended daily vancomycin dose to attain this level?

$$\frac{2000\text{mg}}{10\text{mgc/mL}} = \frac{X\text{mg}}{15\text{mcg/mL}}$$

Total daily dose of vancomycin would be 3000mg or 1500mg every 12 hrs or 1000 mg every 8 hrs.

Remember to account for changing renal function!!

- If renal function is getting better, add on a little more vancomycin
- If renal function is getting worse, decrease the dose a little bit
- Also remember that old kidneys do not clear vancomycin efficiently

Bibliographie:
Des taux <10mg/L peuvent induire une résistance.

EI mineurs: nausées, vomissements, douleurs musculaires, prurit, fièvre, éruption cutanée, hypokaliémie,
EI majeurs: ototoxicité, néphrotoxicité, arrêt cardiorespiratoire, hypotension, neutropénie, agranulocytose, thrombocytopénie.

https://www.globalrph.com/images/VancomycinDosageChart.pdf
www.swissmedicinfo.ch
https://pharmacie.hopitalvs.ch/fr/pharmacie/med/Annexes/Annexe-10_TDM_F_D_vvg_nw.pdf
https://www.universityhealthsystem.com/~/media/files/clinical-pathways/vancomycin-dosing-guidelines-adults-rev10-2014.pdf?la=en
Therapeutic monitoring of vancomycin in adult patients: A consensus review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists. Am J Health-Syst Pharm. 2009;66:82-98

Règles de criticité élevée: plusieurs catégories

1. Médicaments critiques à suivre

- Prescription de colchicine (afin d'évaluer les interactions et les effets indésirables)
- Prescription d'un immunosuppresseur
- Prescription de Mysoline° 250mg
- Prescription de méthotrexate (afin d'évaluer les interactions et les effets indésirables)

Règles de criticité élevée: plusieurs catégories

2. Problème médicamenteux probable

- Prescription de digoxine ET digoxinémie à taux toxique (>3nmol/L)
- Prescription de digoxine ET kaliémie hors norme (<3.5 ou >5.5mmol/L)
- Association d'azathioprine/ mercaptopurine et d'allopurinol/ febuxostat
- Prescription de méthotrexate et GFR<80ml/min
- Prescription de méthotrexate deux jours de suite
- Prescription de colchicine ET GFR< 30ml/min
- Prescription d'EPO plus d'une fois par semaine
- Prescription d'un inhibiteur direct du facteur Xa ET GFR< 15ml/min
- Prescription de dabigatran étexilate ET GFR<30ml/min
- Association de deux anticoagulants oraux
- Prescription de metformine ET GFR<30ml/min OU taux de lactate >5mmol/L
- Prescription de mycophénolate mofetil ET neutropénie (<1.3G/L)
- Prescription de morphine ET GFR<15ml/min (sauf soins palliatifs)
- Prescription de métamizole ET agranulocytose (neutrophiles < 0.5G/L)
- Association de carbamazépine et de clozapine
- Prescription de lévétiracétam et GFR<80ml/min
- Prescription de méthotrexate ET absence d'acide folique
- Prescription d'héparine (HNF ou HBPM) ET thrombocytopénie (=<50 G/L)
- Association de deux médicaments pouvant induire un syndrome sérotoninergique
- Prescription de vancomycine et taux résiduel hors norme (<10mg/L ou >20mg/L)

Règles de criticité élevée: plusieurs catégories

3. Antibiotic stewardship

- Prescription de méropénème durant >3jours