KSA Kantonsspital Aarau

Final report:
Development and Implementation of a Multi-Algorithm-System for the Detection of Medication Errors and Reduction of Adverse Drug Events

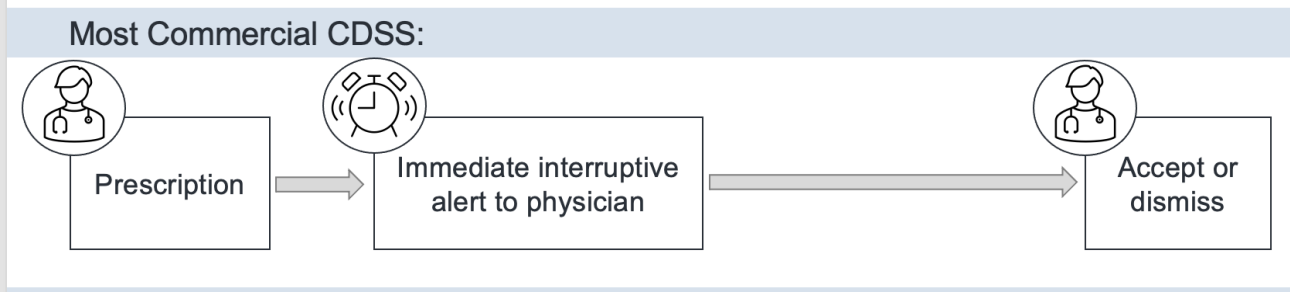
JFSPH, 30.11.2023

Dr. med. Rico Fiumefreddo
Leitender Arzt Allgemeine Innere und Notfallmedizin
Ärztliche Leitung Fachbereich KPHARM

Claudia Zaugg
Leitende Spitalapothekerin Klinische Pharmazie
Pharmazeutische Leitung Fachbereich KPHARM

Hendrike Dahmke
Doktorandin Klinische Pharmazie

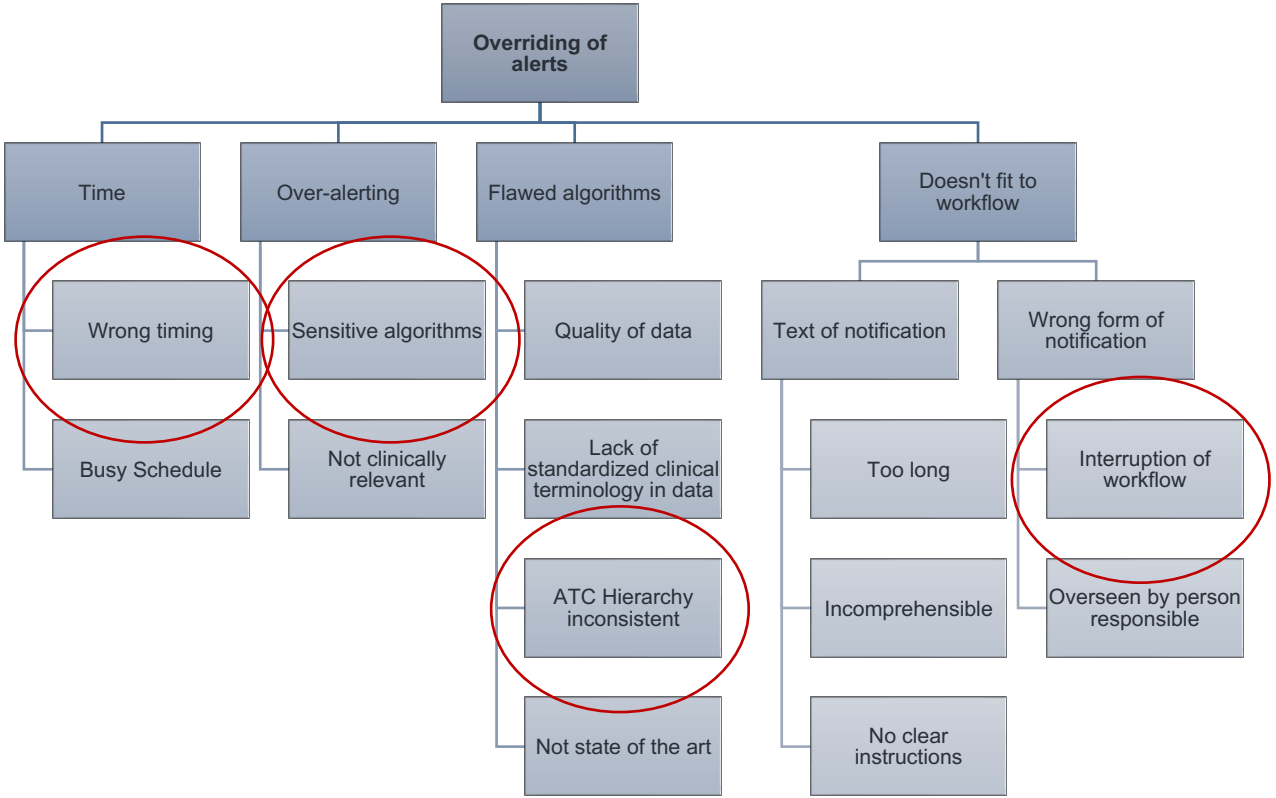
Why we wanted to develop this system…



Type of alert	Overruled	Overruling appropiate
Drug-Drug Interaction[1]	56 – 96%	0 – 95%
Renal Dose Adjustment[1]	74 – 97%	27 – 88%
Drug Duplication[1]	29 – 52%	82 – 99%
Overall[1]	**46 – 96%**	**29 – 100%**

[1]Poly TN et al. Appropriateness of Overridden Alerts in Computerized Physician Order Entry: Systematic Review. JMIR Med Inform. 2020

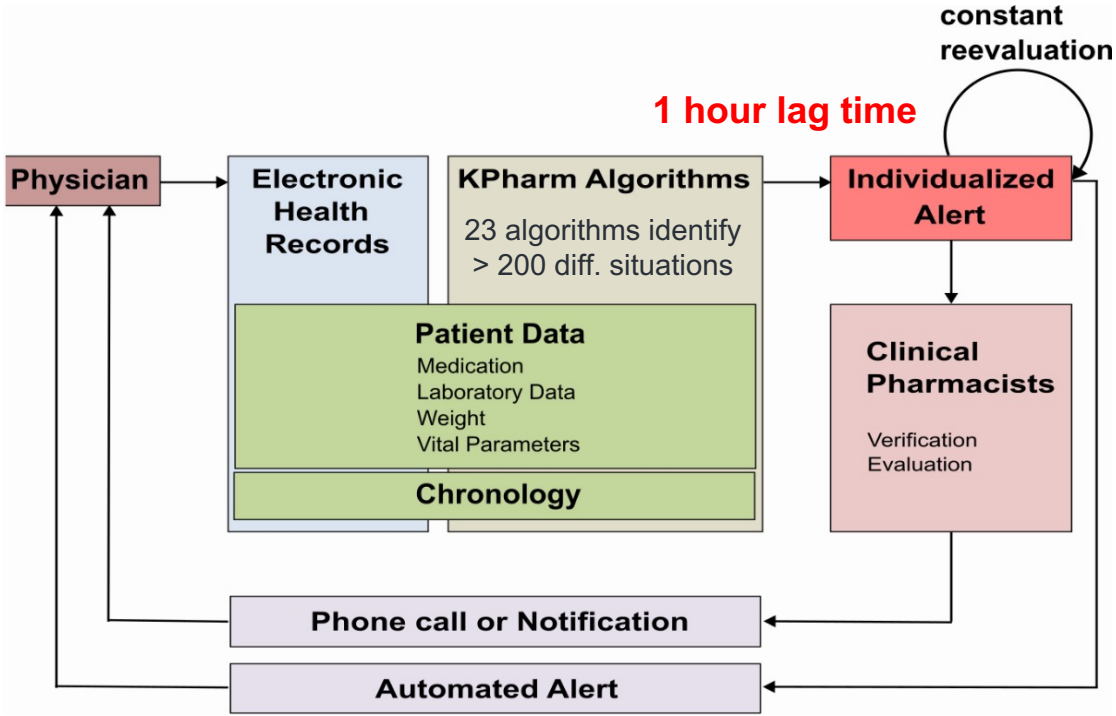
So what's the problem?



KSA

Multi-Algorithm System (MAS): How it works

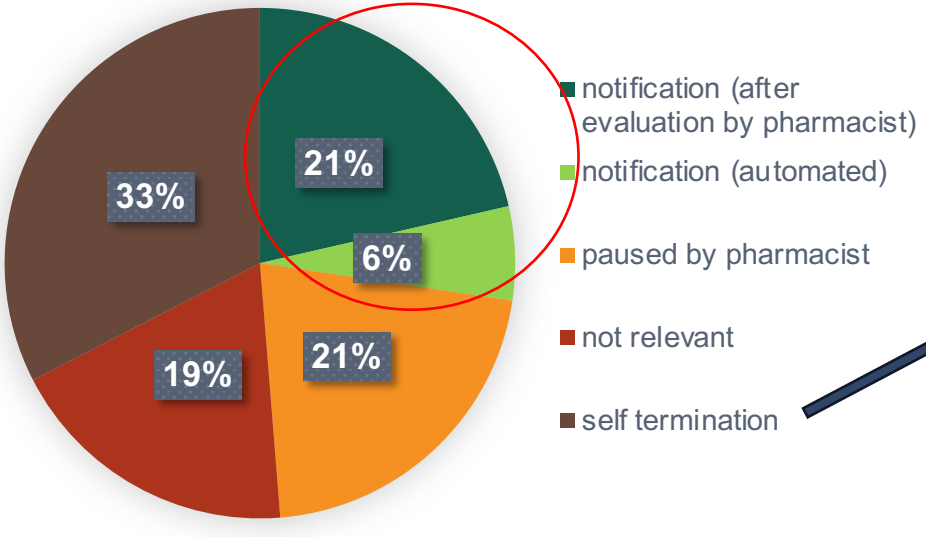
Treshhold values and key parameters adaptable



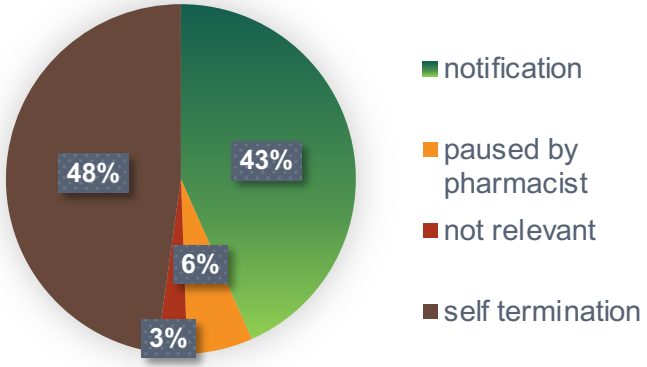
Dahmke H, Fiumefreddo R, Schuetz P, De Iaco R, Zaugg C. Tackling alert fatigue with a semi-automated clinical decision support system: quantitative evaluation and end-user survey. Swiss Med Wkly 2023;153(7):40082. https://doi.org/10.57187/smw.2023.40082

Alerts: what becomes of them?

number of alerts in 2021: 10'556



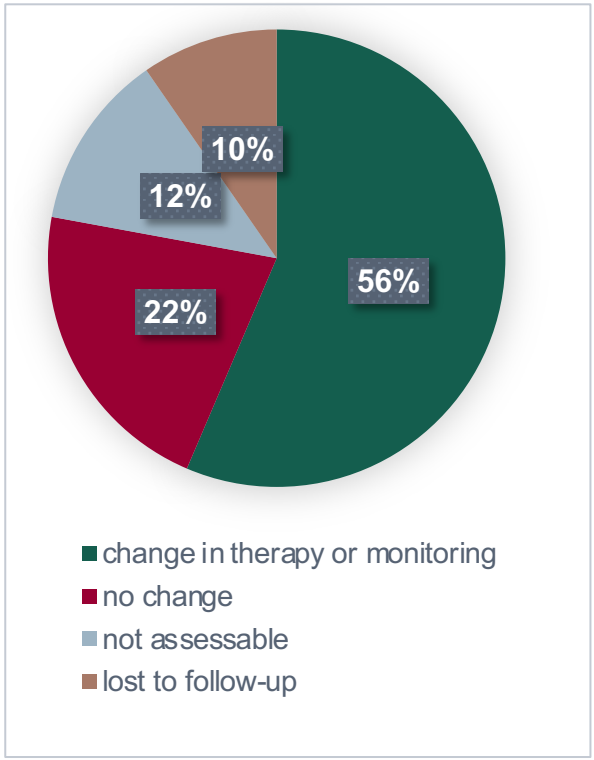
number of anticoagulation alerts: 429



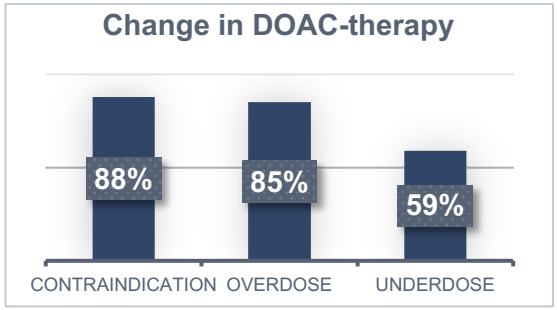
Data for the figure left: Dahmke H, Fiumefreddo R, Schuetz P, De Iaco R, Zaugg C. Tackling alert fatigue with a semi-automated clinical decision support system: quantitative evaluation and end-user survey. Swiss Med Wkly 2023;153(7):40082. https://doi.org/10.57187/smw.2023.40082
Data for the figure right: Dahmke et al. Development of a clinical decision support system to avoid anticoagulant duplications. *Unpublished, article in redaction.*

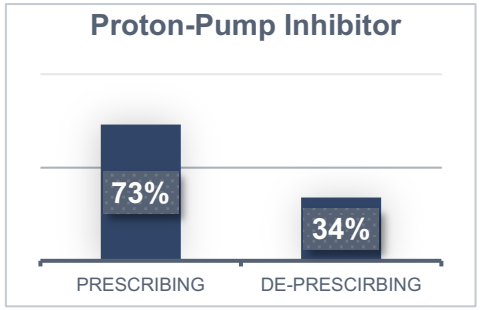
KSA

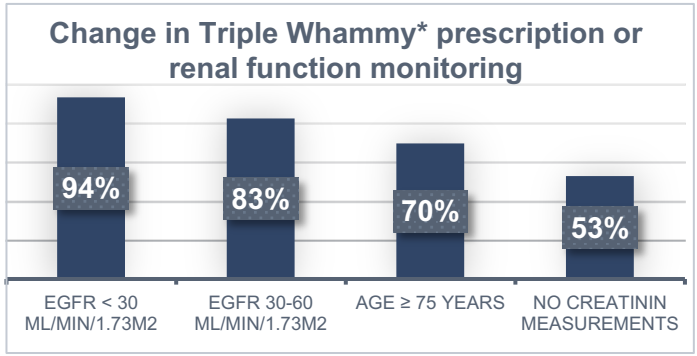
Notifications: what becomes of them?



Notification results in…







*ACEI/Sartan + NSAID+Diuretics

Left: Dahmke H et al. Tackling alert fatigue with a semi-automated clinical decision support system: quantitative evaluation and end-user survey. Swiss Med Wkly 2023;153(7):40082. https://doi.org/10.57187/smw.2023.40082
Middle: Reist C. Appropriateness evaluation of DOAC dosing, after implementation of algorithms designed to detect inappropriate dosing. Master Thesis. Departement Pharmazeutische Wissenschaften der Universität Basel 2020.
Left: Flückiger L. Konzeption, Implementation und Evaluation eines elektronischen Algorithmus zur Detektion fehlender oder ungerechtfertigter Protonenpumpeninhibitoren. Diplomarbeit Weiterbildung FPH Spitalpharmazie 2022
Bottom left: Dahmke H. et al. Evaluation of triple whammy prescriptions after the implementation of a drug safety algorithm. *Accepted for: Drugs Real World Outcomes*

KSA

Sensitivity & Specificity: What our MAS finds

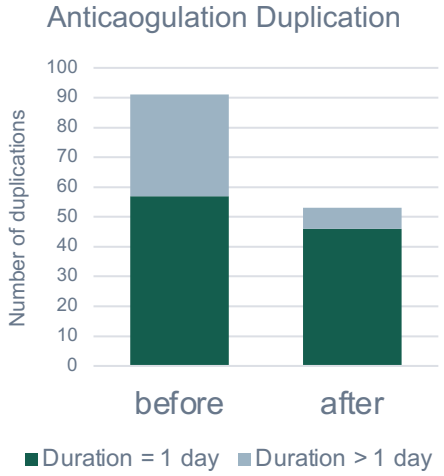
- Data available for the following algorithms:
  - PPI, DOAC, Triple Whammy, Anticoagulation Duplication, oral Switch, Vancomycin, a few renal dosing alerts
- Specificity: > 85%
- Sensitivity, lowest: 45%*, all others >= 62%

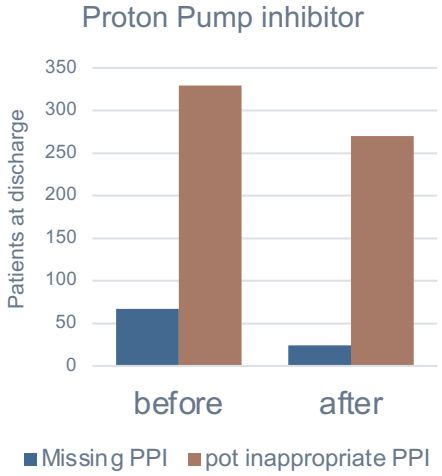
*Due to a misunderstanding during correction work, excluding on-demand NSAID use in one specific alert

All data are or will be publicated on https://www.ksa.ch/zentren-kliniken/spitalpharmazie/forschung

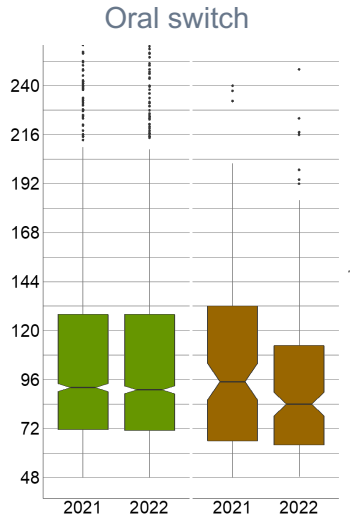
Impact on medication errors?

Comparison before and after





signifikant



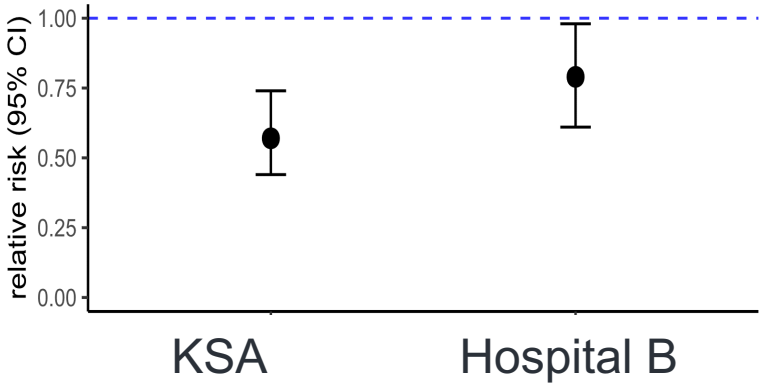
not signifikant

KSA

Comparison: are we too complicated?

Relative risk for anticoagulant duplication in the period after CDSS introduction compared to the period before CDSS introduction.

Hospital B (right) with an interruptive alert during prescription.



Conclusion & … what now?

- Our system can decrease medication errors and has the potential to decrease adverse drug events
- Pharmacist tailoring can reduce alert burden of physicians
- An interruptive alert is not mandatory to impact incidence of medication errors

- We continue to evaluate and optimize our algorithms
- We are open to exchange and colaborate with others

Special thanks to all who supported or participated to the project

- Hendrike Dahmke
- Dr. Rico Fiumefreddo
- Francisco Cabrera
- Dr. Ali Reza Salili
- Dr. Marc Heizmann
- Andreas Kundert
- Remo De Iaco
- Prof. Beat Müller
- Dr. Richard Egger
- Actual and former Clinical Pharmacy Team at KSA
- Our master students and FPH candidats: Carmen Reist, Sophie Stoos, Jana Schelshorn, Cindy Somsak, Lee Flückiger
- …

and to all who exchanged their experience with us

- GSASA Forschungspreis Jury & Sponsoren

Thank you for your attention