R-QUA-22

Evaluation of an algorithm to promote the switch from intravenous to oral antibiotics

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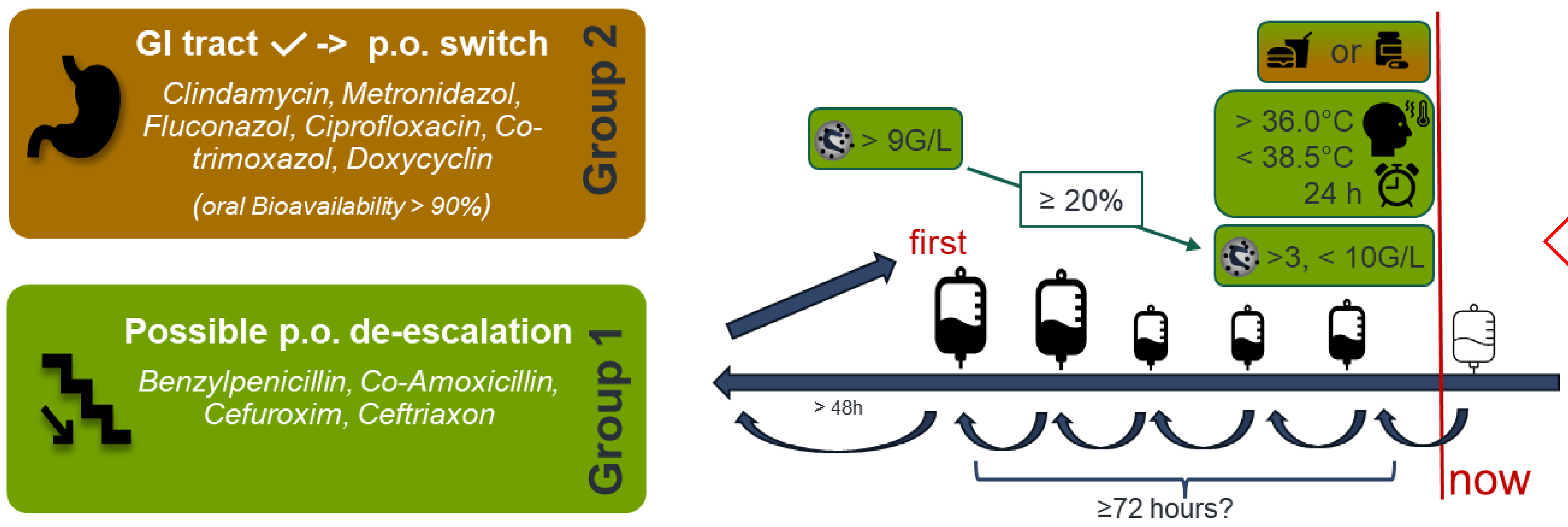
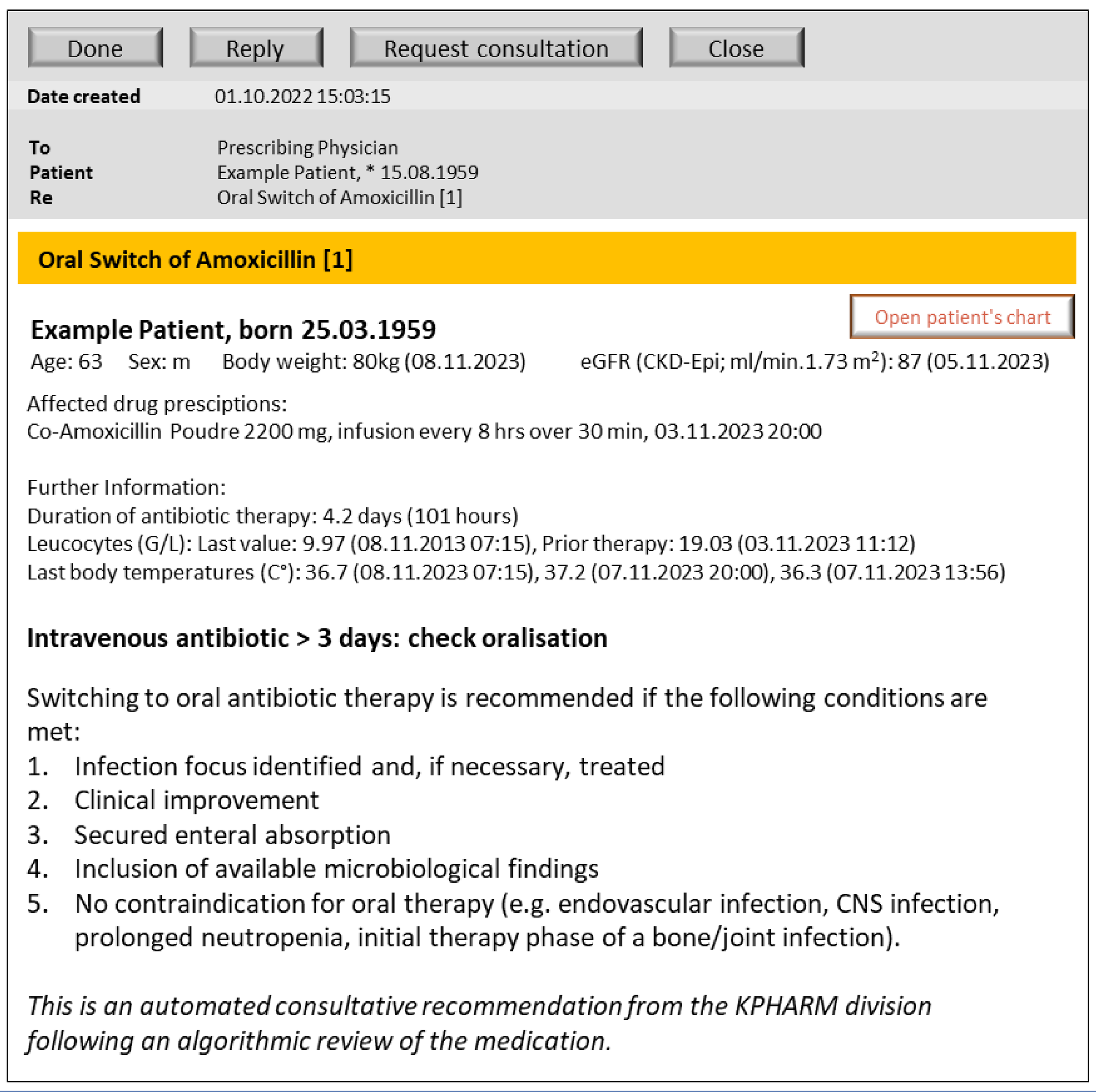
Introduction & Objectives

The Kantonsspital Aarau, a tertiary care hospital, implemented an algorithm-based clinical decision support (MAS) to detect medication errors and risk situations for adverse drug events[1]. One of the algorithms promotes the switch from intravenous to oral antibiotics, currently monitoring 10 antibiotics. The algorithm automatically generates an alert when certain conditions are met (fig. 1), but soonest 72 hours after the first administration. The effect of this algorithm on the duration of i.v. therapy and its performance (sensitivity, specificity, uptake rate) was evaluated.





Done	Reply	Request consultation	Close

Date created 01.10.2022 15:03:15

To Prescribing Physician
Patient Example Patient, * 15.08.1959
Re Oral Switch of Amoxicillin [1]

Oral Switch of Amoxicillin [1]

Open patient's chart

Example Patient, born 25.03.1959
Age: 63 Sex: m Body weight: 80kg (08.11.2023) eGFR (CKD-Epi; ml/min.1.73 m²): 87 (05.11.2023)

Affected drug presciptions:
Co-Amoxicillin Poudre 2200 mg, infusion every 8 hrs over 30 min, 03.11.2023 20:00

Further Information:
Duration of antibiotic therapy: 4.2 days (101 hours)
Leucocytes (G/L): Last value: 9.97 (08.11.2013 07:15), Prior therapy: 19.03 (03.11.2023 11:12)
Last body temperatures (C°): 36.7 (08.11.2023 07:15), 37.2 (07.11.2023 20:00), 36.3 (07.11.2023 13:56)

Intravenous antibiotic > 3 days: check oralisation

Switching to oral antibiotic therapy is recommended if the following conditions are met:

1. Infection focus identified and, if necessary, treated
2. Clinical improvement
3. Secured enteral absorption
4. Inclusion of available microbiological findings
5. No contraindication for oral therapy (e.g. endovascular infection, CNS infection, prolonged neutropenia, initial therapy phase of a bone/joint infection).

This is an automated consultative recommendation from the KPHARM division following an algorithmic review of the medication.

Fig. 1:

Above: **Algorithm workflow after detection of a monitored antibiotic prescription**: The algorithm identifies the first i.v. administration by working backwards from one administration to the previous one until it finds no other administration within 48h. For both antibiotic groups it then checks whether the following condition is met: Within the last 6 hours, the patient has taken any oral medication or has been fed orally/enterally. Additionally for group 1: the temperature in the last 24 hours must have been between 36 and 38.5° C, the leucocytes must be between 3 and 10G/L and must have decreased by at least 20% compared to the start of therapy (which must be > 9G/L).

Right: Example of the group 1 alert displayed at the top of the electronic prescribing chart.

Methods

Retrospective comparison of the duration of i.v. treatment lasting for > 48h in adults during 12 months before (2021) and after (2022) introduction of the algorithm. Duration is defined as time between first and last i.v. administration, if interrupted for over 48h, count restarts according to the algorithm behaviour. ICU is excluded (different electronic health record). The technical sensitivity and specificity of automated alert was calculated, and anti-infective therapy outcome post-alert was analysed.

Results

In 2021 and 2022, there were 2266 and 2517 i.v. therapies, respectively (fig 2). No significant difference was found in the duration of i.v. therapies, but there was a trend towards shorter duration of i.v. therapies of group 2 antibiotics in 2022 (fig. 3).

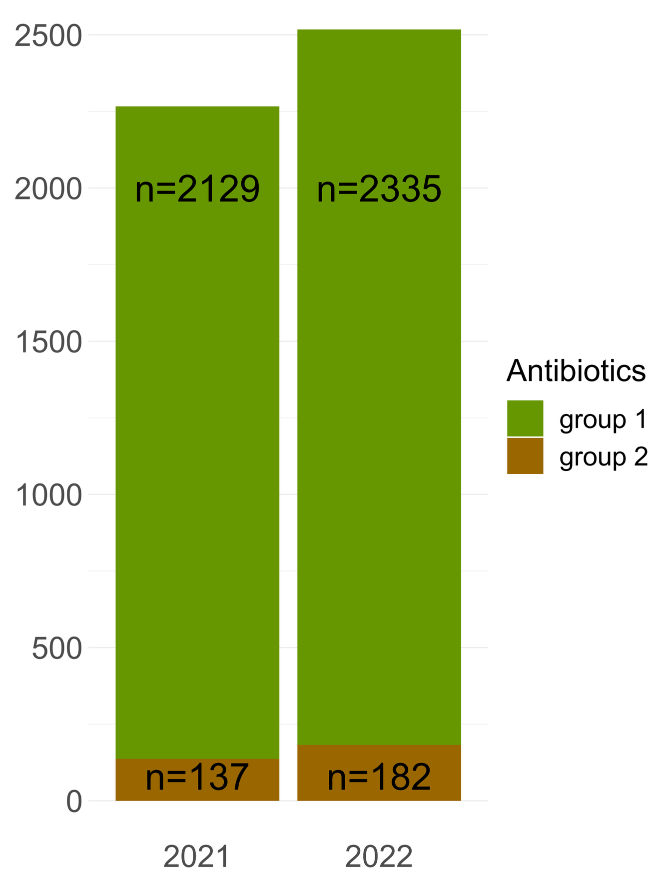


Fig. 2: Number of i.v. therapies before (2021) and after (2022) implementation of the algorithm in the electronic health record.

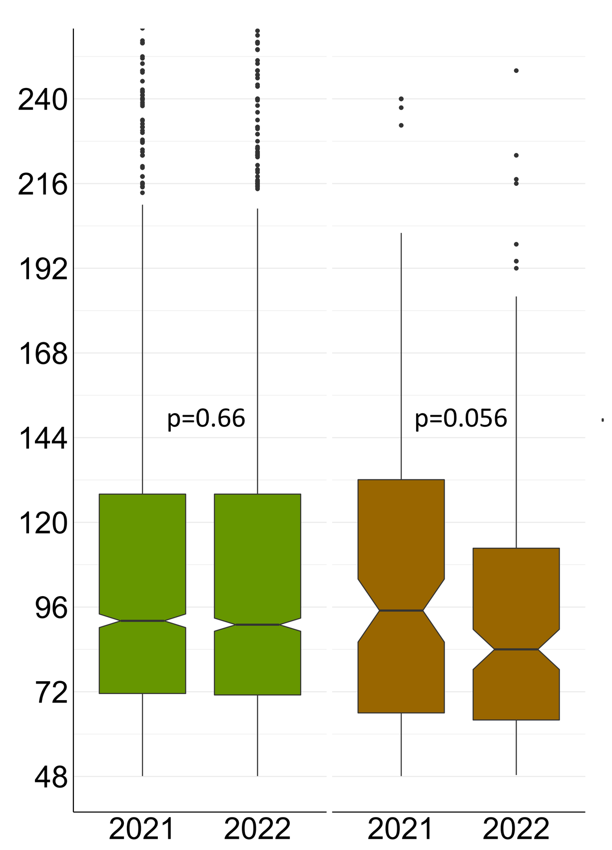


Fig. 3: Duration of i.v. therapy in hours Outliers (250 - 995h) have been faded out.

In 2022, an alert was generated for 559 treatments (22.2%). In 21% of the alerts, the patient was discharged within 24h after the alert and in another 14% the antibiotic treatment was stopped. Of the remaining patients with an alert, 29% were switched to oral therapy within 24h post-alert (fig. 4).

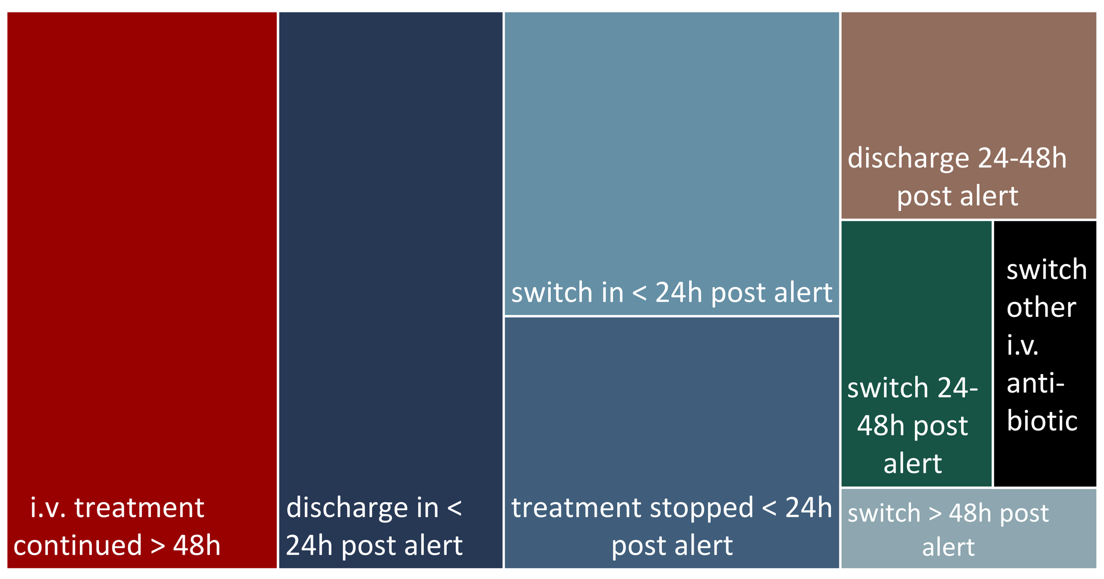


Fig. 4: What happend after an alert was sent?

Outcome of treatments for which an alert was triggered 72 hours (or later) after the first i.v. administration.

The calculated specificity of the automated alert is 99%, sensitivity 89%.

Discussion

The algorithm did not reduce the duration of i.v. therapy so far. This may be explained by the relatively low alert rate and short duration of treatment. In addition, 35% of all patients with an alert were discharged within 24h or the antibiotic was stopped. Only 29% of patients for which an alert was triggered were switched to oral treatment within 24 hours. This can be considered as the take-up rate of the alert. Perhaps fear of adverse outcomes prevents physicians from oral switch guided only by an automated standard alert. Prior individualising of the recommendation in the alert text by pharmacists or infectiologists may improve the future outcome.

1) https://doi.org/10.57187/smw.2023.40082