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Clinical Pharmacy Interventions in an Austrian hospital: A report highlights the need for the implementation of clinical pharmacy services

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Abstract

Title: Clinical Pharmacy Interventions in an Austrian hospital: A report highlights the need for the implementation of clinical pharmacy services

Background: Clinical pharmacy services face challenges in Austria due to limited implementation and acceptance, outdated legislation, and a lack of guidelines and training, despite the evidence from global studies of the positive impact of clinical pharmacists on patient care.

Objectives: This study aims to identify the necessary types of clinical pharmacy interventions required at a 360-bed hospital located in Austria. The second aim is to evaluate the extent to which physicians accept the suggestions made by clinical pharmacists.

Methods: Over a period of 27 months, a clinical pharmacist made a series of interventions, which were evaluated using a six-point clinical significance scale. To determine the inter-rater reliability, a subset of 25 interventions was assessed for their clinical significance by four independent internal medicine physicians.

Results: A total of 1064 interventions were made by the pharmacist. Clinical pharmacy input was deemed necessary for 72.3% (986 out of 1364) of patients, with an average of 1.08 interventions per patient. The prompt acceptance rate of these interventions by physicians was 83.5% (888 out of 1064), while 12.9% (137 out of 1064) were considered by physicians but not immediately acted upon. The average clinical significance intervention rating was 2.15. The inter-rater reliability agreement between the four MDs and between the four MDs and the pharmacist was classified as 'good' to 'moderate'.

Conclusion: This study in a secondary care Austrian hospital demonstrates the requirement for clinical pharmacy services, which are highly valued by other healthcare professionals. The clinical pharmacist is a key member of the multidisciplinary ward team, playing a vital role in reducing drug related problems and enhancing patient safety. This work should now be scaled and tested in other Austrian hospitals.

Key messages

What is already known on this topic?

A wealth of research underscores the global benefits of clinical pharmacy services for patient safety and well-being. However, the acceptance of these interventions varies significantly, contingent upon diverse factors.

What this study adds?

This study addresses a notable gap by highlighting the absence of Austrian publications on this subject. It emphasizes the imperative of introducing clinical pharmacy services in a small rural Austrian hospital and gauges their acceptance among medical staff.

How might this study affect research, practice or policy?

This study has the potential to inspire Austrian clinical pharmacy researchers to share their findings, fostering a culture of knowledge dissemination. Moreover, it could stimulate increased scientific engagement, staffing, and policy adjustments within hospitals, ultimately impacting healthcare quality and policy decisions.

Keywords

- Clinical competence
- Drug-related side effects and adverse reactions
- Evidence-based medicine
- Quality of health care
- Patient safety
- Medical errors
- Public health
- Pharmacy service, hospital

Introduction

According to the European Society of Clinical Pharmacy (ESCP), "Clinical pharmacy aims to optimise the utilisation of medicines through practice and research in order to achieve person-centered goals"[1]. Clinical pharmacy services (CPS) have seen significant progress in recent years, but their implementation and acceptance varies greatly among countries. In Austria, only 15,8% of hospitals have a pharmacy department with even less providing CPS on a regular basis[2]. The traditional roles and perceptions of medical and pharmacy staff make it challenging to expand the scope of CPS[3–5]. The positive impact clinical pharmacists have on patient care is already accepted by medical and nursing staff, however, more needs to be done to change stakeholders' perspectives and implement necessary legislative changes. Efforts made by clinical pharmacists in Austria to highlight the necessity of expanding CPS throughout the country remain unacknowledged[3,4], partly, because larger local multicentre studies are still missing but also because politicians and stakeholders still do not understand the significance of clinical pharmacy in promoting patient well-being and improving the cost efficiency of medication management. This is due to current legislation in Austria failing to acknowledge the importance of integrating CPS into Austrian hospitals[6]. Furthermore, there is no defined role for clinical pharmacists in the legislation, and no guidelines for the clinical pharmacist to patient bed ratio that should be implemented in each hospital[7]. Compared to other European countries, pharmacists in Austria are not utilised to the same extent as their education and training would suggest. Urbanczyk et al. have described similar problems in other Central and Eastern European countries and advocate for broad implementation of CPS[8]. Austria is currently grappling with a significant deficit in both medical and nursing personnel. However, politicians are both currently not addressing nor considering other professional groups as potential solutions. This problem could be partially alleviated by shifting some responsibilities to pharmacists and technicians, as has been demonstrated in numerous other countries both recently and in the past[9–12]. This

study aims to highlight the need for CPS in hospitals across Austria, the acceptance rate of clinical pharmacy interventions by physicians and the impact on patient safety by having a clinical pharmacist on the ward team.

Methods

General description

This study was conducted at the Tauernklinikum in Zell am See, Austria, a 360-bed rural clinic in the state of Salzburg. The clinical pharmacy interventions (CPIs) took place on a 72-bed medical ward and a 68-bed orthopaedics/traumatology ward. The patients were selected via convenience sampling by the clinical pharmacist during ward rounds over a 27 month collection period. All sampled patients were on polypharmacy (i.e. those with five or more prescribed medications) and over the age of 18. Patient rooms based on ward round groups were chosen and medication reviews conducted for those patients. The pharmacist would coordinate with the medical staff to determine when the ward round would start and then join in. Not all patients in the selected rooms were seen due to time constraints. A similar approach was used for remote type 2b medication reviews according to the Pharmaceutical Care Network Europe (PCNE)[13], where the pharmacist would make suggestions over the phone or through electronic patient records, instead of joining the ward round in person.

Data collection

The data for this study were collected during the routine work of the hospital's clinical pharmacist. A document was used to record the CPIs, which was adapted from a French publication[14] for use in Austria by the Austrian Association of Hospital Pharmacists[15]. The document contains records of the pharmacist's initials, the date and details of the intervention,

the doctor's initials, and the patient's gender and age. The number of patients reviewed for medication appropriateness was documented on days when CPIs occurred. Patients without polypharmacy or with clearly absent medication-related issues were excluded from the review. The pharmacist rated the interventions using a 6-point significance scale according to Hatoum[16], as can be seen in table 1.

Table 1 Scale for Recommendations' Potential Impact on Patient Care - Reproduced from Hatoum et al. Evaluation of the contribution of clinical pharmacists: inpatient care and cost reduction

Rating	Explanation
X	Adverse significance: Recommendation may lead to adverse outcomes
0	No significance: Recommendation is informational (not specifically related to patient in question)
1	Somewhat significant: Benefit of recommendation to patient could be neutral, depending on professional interpretation
2	Significant: Recommendation could bring care to more acceptable and appropriate level
3	Very significant: Recommendation qualified by potential or existing major organ dysfunction
4	Extremely significant: Information qualified by life-and-death situation

To reduce bias, a random sample of interventions was rated by two medical consultants and two medical registrars. The ratings were then evaluated, and a mean was calculated for each coder. SPSS was used to perform a two-way model inter-rater reliability (IRR) analysis for the four different raters' assessments to determine the intra-class correlation (ICC). The pharmacist's rating was then correlated with the ICC to determine if it could be extrapolated to all 1064 pharmacist intervention ratings.

Ethics approval

Ethical approval was sought from the Salzburg ethics committee but was not necessary for this study, as all patient and staff data has been fully anonymized.

Results

General results

A total number of 1064 CPIs were made from the first of December 2020 until the 16th of February 2023. Of these, 866 were undertaken on the medical ward and 198 on the orthopaedics/traumatology ward. Pharmaceutical orthopaedics/traumatology ward round participation was started later, from September 2022, with only very few CPIs being made before that date and only on request. The average age of patients needing an intervention was 73.4 (± 13.5) years, internal medical patients being 74 (±12.5) and orthopaedics/traumatology surgery patients 70.8 (±16.9), respectively. In total, female patients accounted for 502 out of 1064 (47.2%) and male patients needing an intervention were 562 out of 1064 (52.8%).

Acceptance rates

The pharmacist worked with 37 different physicians.

Of all interventions undertaken, prompt acceptance rate by the physicians involved was 83.5% (888/1064). In 12.9% (137/1064) of all interventions a change was considered by the physician but not promptly followed through with (i.e. where laboratory reports were still missing to make an informed decision or where they wanted to discuss with a medical colleague first). Only six of all CPIs were immediately declined where:

- Nicorandil was prescribed at 10mg 1-0-0; the pharmacist suggested to split the dose to b.i.d. as per SmPC, because of the short elimination half-life of Nicorandil. The recommendation was rejected because the physician felt that the patient's coronary artery disease was well adjusted with their current medication.
- Patient with hyperkalaemia and previously prescribed combination of spironolactone and furosemide. Re-initiation of furosemide to lower potassium levels was suggested by the

pharmacist, but the patient was not oedematous at that point and terminal. All medication apart from analgesia and sedatives were stopped at that juncture.

- Patient with extensive polypharmacy with a high risk for bleeds was prescribed Pradaxa at 79 years at 150mg 1-0-1. Pradaxa dose reduction was discussed but the patient's serum creatinine was 0.7, which indicated good kidney function, so the dose reduction was rejected.
- Pantoprazole was prescribed in a therapeutic dose without indication. The pharmacist suggested a reduction to 20mg per day (prophylactic dose) as per guideline[17]. The recommendation was not accepted because of a higher bleeding risk due to the advanced age of the patient and left at 40mg.
- The pharmacist recommended ECG for QTc interval control where a patient had duloxetine and trazodone prescribed concomitantly with a previous QTc of over 500ms. The physician stated that the patient had a left bundle branch block and therefore QTc prolongation was not dangerous and no need for ECG control.
- ECG for QTc interval prolongation control was recommended for a patient who was prescribed Alfuzosine previously with the new addition of pantoprazole, amitriptyline and prothipendyl. The recommendation was rejected because taking ECGs is an uncommon measure on the orthopaedics/traumatology ward and would need input from internal medicine.

The remaining 33 interventions were informational (i.e. where the intervention was undertaken after the patient had left the hospital or the drug(s) concerned were already deprescribed) or not assessable for acceptance.

Medication related problems (MRPs)

The distribution of types CPIs to address MRPs can be seen in the Figure 1. Drug-drug interactions were sub-categorised into "to be considered", "use with caution", "avoid combination" and "combination contraindicated". Altogether, 150 interventions involved drug-drug interactions, where 4 were categorized as "to be considered", 21 "use with caution", 104 "avoid combination" and 21 as "combination contraindicated".

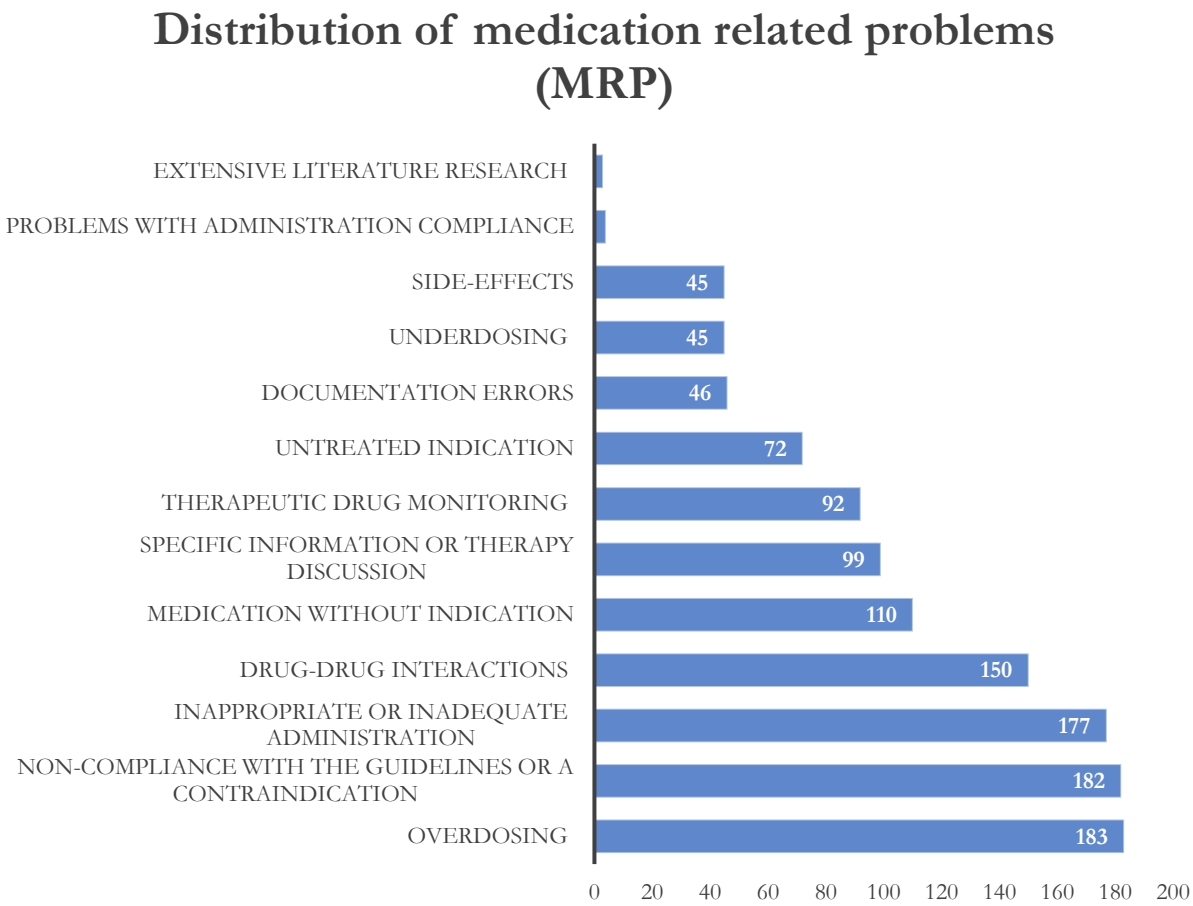

Figure 1 Bar chart showing distribution of reported MRPs

Interventions

The different types of CPIs that were undertaken can be seen in Table 2.

*Table 2 Types of CPIs undertaken**

Types of Interventions	**Of 1064 total interventions**
New medication prescribed	75
Medication stopped	322
Medication changed to different medication	69
Route of administration altered	4
Medication patient monitoring suggested	111
Optimisation of administration	107
Dose-adjustment undertaken	252
More detailed information provided	101
Organisational-administrative support provided	25
Support provided for document optimisation	32

**double-categorisation was possible*

Significance of CPIs

The overall average score for all 1064 CPIs taken was 2.15. Figure 2 shows the distribution of these scores. Of all interventions, 99% (1053/1064) were rated "2" or higher; which means a „significant", "very significant" or "extremely significant" pharmaceutical intervention. This indicates that CPIs implemented at Tauernklinikum in Zell am See have been found to potentially enhance patient care and have the potential to prevent medication errors that may result in organ failure or fatal outcomes, as measured by the Hatoum scale[16]. Interventions were rated for significance by the clinical pharmacist. To demonstrate IRR, 5 out of the interventions rated 1 and 4, respectively and 10 out of the ones rated 2 and 3, respectively were chosen randomly in Excel functions for rating by two registrar medical doctors and two consultant medical doctors as illustrated in Figure 3. Of these randomly chosen interventions for IRR, 5 repetitive interventions have been dismissed before the interventions were listed for MDs

to rate them. The clinical pharmacist rated the 25 interventions with a mean of 2.68. The MDs rated with a mean of 2.45, where one mean was 1.64, one 2.36, one 2.84 and one 2.96.

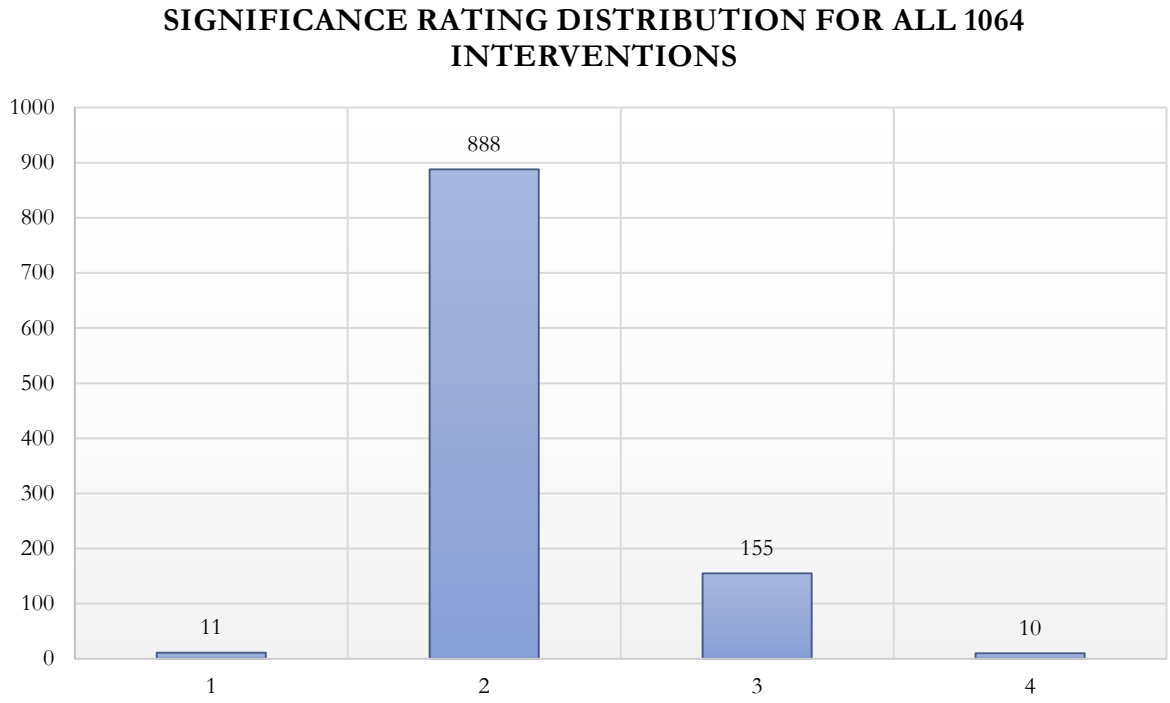

Figure 2 Bar chart showing significance rating distribution for all 1064 interventions

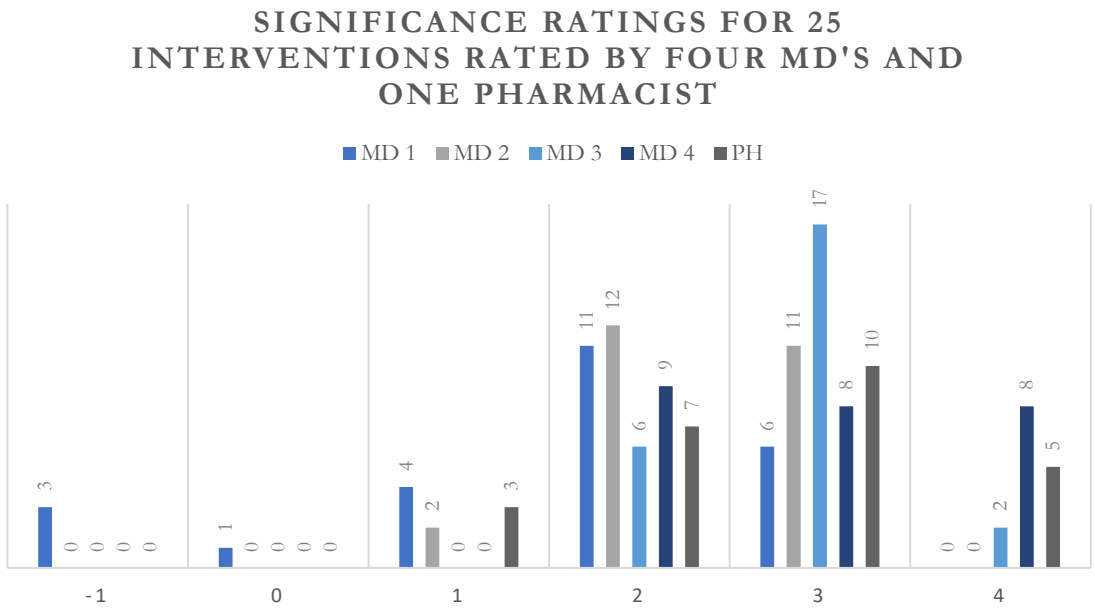

Figure 3 Significance rating for 25 interventions rated by four MDs and one pharmacist

The average measurement of ICC for the four consultant coders was 0.749, with a 95% confidence interval ranging from 0.538 to 0.878. The average measurement for "absolute agreement" was 0.624, with a 95% confidence interval ranging from 0.280 to 0.820. These calculated ICC values indicate "good" agreement for average measurement and "moderate" agreement for absolute agreement among the four coders. The single measures were low, with consistency at 0.428 and absolute agreement at 0.294. However, when correlated with the pharmacist's scores, the ICC values for consistency and absolute agreement were 0.780 and 0.693, respectively, indicating "good" and "moderate" agreement. The Crohnbach's alpha of 0.780 suggests high reliability, especially considering the two different professional rater groups[18]. Overall, the high percentage of significant pharmaceutical interventions and the agreement between raters suggest that CPIs at Tauernklinikum in Zell am See are effective in improving patient welfare and reducing the risk of medication errors and potentially fatal outcomes.

Cost reduction

In Figure 4, the potential for cost reduction resulting from the suggested pharmaceutical interventions is shown. These interventions included medication discontinuation, which accounted for 31.9% (339/1064) of the cases, dose reduction, which accounted for 19.5% (207/1064) of the cases, and the remaining interventions (48.6%, 518/1064) which did not directly lead to cost reduction.

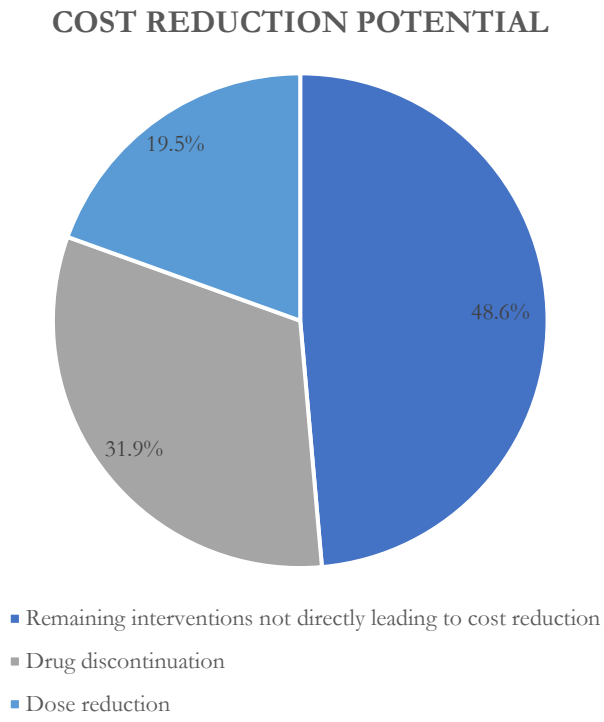

Figure 4 Cost reduction potential

Discussion

General results

Considering the aging population and medical specialties, this study suggests that there is a significant demand for clinical pharmacy input in both, medical and orthopaedics/traumatology wards. The average age of patients who required interventions was high, which is consistent with the demographic trend of an ageing population. Additionally, the gender distribution indicates

235 that both male and female patients require CPIs, emphasizing the need for gender-inclusive
236 healthcare services.
237
238 ## Acceptance of CPIs
239 Numerous studies have shown significant variation in acceptance for CPIs across Europe and
240 the UK[19–24]. In Tauernklinikum Zell am See, approximately 72.3% (986 out of 1064) of
241 patients sampled require CPIs, indicating a clear need for medicines reconciliation and medicines
242 review. However, due to staffing constraints, this remains an issue in most Austrian hospitals.
243 The absence of clinical pharmacists in the multidisciplinary ward team poses a gap in optimising
244 medicine use, reducing MRPs, and improving patient safety. According to the Chief Executive of
245 the Society of Hospital Pharmacists of Australia, in 2018, the recommended case load for one
246 hospital pharmacist is a maximum of 30 patients[25]. For a 360-bed hospital, like the one in this
247 study, this translates to 12 full-time clinical pharmacists. However, the actual staffing level is only
248 0.75 WTE (whole-time equivalent).
249 The numerous ward rounds with both disciplines represented, the pharmacist and the rounding
250 physicians, demonstrates valuable collaborative efforts between pharmacists and physicians in
251 patient care. Multidisciplinary ward round teams have been highlighted to be beneficial for the
252 patient in many publications[26–29].
253
254 Most recommendations made by the pharmacist were accepted and implemented by physicians.
255 This demonstrates the value of the pharmacist as important member of the healthcare team,
256 providing expertise in medication management and helping to improve patient outcomes.
257 Not only promptly accepted interventions were recorded but also in 12.9% of interventions, a
258 change in medication therapy after following up laboratory reports and patients' and/or
259 colleagues' consultation, was considered by physicians based on the pharmacist's

recommendations. This shows that the pharmacist was able to identify and address medication-related issues that required further attention and intervention.

In some instances, pharmacist recommendations were declined by physicians immediately. Reasons for refusal included patient preference, clinical status, and concerns about bleeding risk or other medical conditions. These cases highlight the importance of effective communication and collaboration between pharmacist and physicians in the decision-making process for medication therapy and taking patient preferences into consideration when reviewing medications as per the Scottish polypharmacy guidance for realistic prescribing[30].

A small percentage (3.1%) of interventions were purely informational, meaning that the intervention was undertaken after the patient had left the hospital or the drug(s) concerned had already been deprescribed. This highlights the challenges of timely communication and coordination among healthcare providers in a hospital setting, and the need for effective communication channels and protocols for medication management.

Types of CPIs

The main type of CPI observed was overdosing, which can be explained by non compliance with PPI prescribing guidelines. Halving the therapeutic dose to the prophylactic PPI dose is not a common practice and was addressed on ward rounds many times.

However, non-compliance with guidelines was the second most common drug related problem to be addressed. The interventions in this section included expanding the scope of individual patient treatment, addressing unfamiliarity with guidelines, and failure to adjust dosages in cases of organ dysfunction.

The third largest category of interventions was inappropriate or inadequate drug administration.

The fourth category involved drug-drug interactions.

Consultants and registrars were receptive to and accepting of discussions with the pharmacist regarding MRPs which supports previous findings from work undertaken in Northern Ireland that highlight the complementary role of pharmacists in the multidisciplinary team on the ward[10].

Significance of CPIs

According to their independent medical and pharmaceutical significance ratings CPIs undertaken in this report have the potential to enhance patient care and prevent medication errors that may result in significant morbidity. It strongly indicates that clinical pharmacist input is an essential component of multidisciplinary ward teams, leading to more comprehensive and holistic patient therapy, optimising medication use and ensuring patient safety.

By incorporating various professional opinions, including those of pharmacists, psychologists, physiotherapists, and others, into their patient care plans, physicians are able to broaden their perspective beyond purely medical considerations, resulting in improved patient care. This interdisciplinary approach has been supported by numerous studies that have shown its benefits.[9,11,12,31–33]

Cost reduction

Discontinuation of medication and dose reductions are important strategies for reducing costs through CPIs and ensuring prudent medicines use. Schumock et al. have evidenced in 2003 that, in addition to enhancing patient care, CPIs on the wards have the potential to yield cost savings in medication expenditure[34].

Other CPIs that do not directly lead to cost reduction may still have significant impact on hospitalisation and sickness prevention in the long term due to various reasons. Scott et al. have showcased between 2000 and 2014 in Northern Ireland that CPS can reduce length of hospital stays by 2 days, increase time to hospital readmission by 20 days, decrease ward round time by more than 25 minutes and decrease discharge time by over 90 minutes. Not only were CPS indirectly cost saving by saving time but also via error reduction (admission drug history error reduction per patient by 4.2 and improvement of discharge medication accuracy was <1% compared with 25% by medical staff). [10]

These interventions may prevent disease progression or complications, improve patient outcomes, and enhance patient satisfaction and adherence. It is crucial to consider the multifactorial nature of cost reduction in healthcare and evaluate various outcomes when assessing the value and impact of CPIs.

Similarly, in 2022 Urbanczyk et al. have demonstrated that CPIs on surgical wards demonstrate cost-avoidance via prevention of adverse drug events and a cost-benefit ratio of 1:9.5 in the Polish hospital setting[7].

Limitations

- Limited Generalizability: The findings of a single site report may not be generalisable to some other settings, as patient populations and clinical practices can vary widely across different sites.
- Limited Scope of Practice: The interventions proposed by the pharmacist may be limited by their scope of practice, which may not encompass all potential MRP or interventions.
- Lack of Blinding: Since the pharmacist is the only individual proposing interventions, there is no blinding in the study, which may introduce bias in the assessment of outcomes.

- Limited Impact Assessment: There was no ability to look at the impact on other healthcare resource use.

Conclusions

Overall, this study concludes that the CPIs implemented at Tauernklinikum in Zell am See have been found to enhance patient care, reduce medication errors, and have the potential to result in direct cost reduction. The interventions were well accepted by physicians and were rated as significant by both the clinical pharmacist and medical doctors involved in the study. It showcases the significant potential and urgent need for the development and expansion of CPS in a small Austrian hospital.

Since it is only a single site report the authors hope it will inform stakeholders and peers to expand such observational research on the significance, acceptance rates, cost reduction and need of CPS to other Austrian hospitals. One of the main reasons for the underdevelopment of CPS in Austria is the drug-oriented curriculum in undergraduate pharmacy degrees with limited emphasis on patient-centric pharmacotherapy, leading many clinical pharmacists to seek self-education or additional clinical degrees from overseas[35,36]. Additionally, lack of funding for CPS through insurance systems hinders their growth in Austria. The current demographic development leads to a lack of medical and allied health professionals; utilizing CPS could significantly alleviate medical personnel in certain areas (medicines reconciliation, medication reviews, patient admission and discharge, communication with extramural interfaces, stocking on wards, medication preparation for administration, amongst others). Politically, these issues would best be addressed by obtaining enough data to support CPS implementation in Austrian hospitals.

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Funding, conflict of interest and raw data accessibility

The authors declare no conflicts of interest and no funding for this study. Raw data are with the corresponding scientist and can be requested.

Contributorship

SG was involved in all stages of preparing this manuscript. AC, AA and MS helped with planning, conception, data analysis and interpretation of data and also reviewing the manuscript.

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Figures

Tables