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Deprescribing vitamin B6 in a Singapore community hospital

Alvin Shao Qiang Ong ,[1] Keith Zhong Hui Lee,[2] Yee Shiang Wong,[2] Eng Fui Lim,[2] Dalvin Wan Hong Koh,[2] Hui Yun Soh,[2] Tsui Pik Chan,[2] Gabriel Gerald Wenjun Yee,[1] Yu Xian Loo,[1] Cheryl Yan Fang Tan[1]

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[1]Post Acute and Continuing Care, Outram Community Hospital, Singapore
[2]Pharmacy Services, Outram Community Hospital, Singapore

Correspondence to
Dr Alvin Shao Qiang Ong; alvinong@gmail.com

ABSTRACT

Introduction Vitamin B6 is commonly prescribed in hospitals in Singapore, although the clinical benefits are unclear. The Singapore Health Science Authority released a safety alert on high-dose vitamin B6 and the risk of peripheral neuropathy in May 2023.

Methods Patient case notes were reviewed at the beginning of the project, revealing that vitamin B6 was successfully deprescribed in 15.2% of eligible patients at our hospital.

We used a swimlane diagram to map processes and cause-and-effect diagrams to identify root causes. We brainstormed for interventions using 72 change concepts, aiming to streamline medication management practices for deprescribing vitamin B6.

Results The percentage of patients with successfully deprescribed vitamin B6 increased from 15.2% to 100% during the project period. This corresponded to an 84.8% improvement. The additional 22 patients who had vitamin B6 deprescribed amounted to cost-savings of 1686 Singapore Dollars (SGD) per year. The projected savings over 1 year based on the current rate of deprescribing can be estimated to be SGD 13 567 per year. Furthermore, the new protocol that helped identify suitable patients for deprescribing has also led to positive feedback from the medical and pharmacy teams.

Conclusion In conclusion, this project facilitated a significant increase in the percentage of patients with successful vitamin B6 deprescription, reducing patients' pill burden, side effects and medication costs. It also resulted in a new protocol guideline for our healthcare teams to consider vitamin B6 deprescription in suitable patients.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Vitamin B6 is commonly prescribed in a hospital setting. However, its routine use in patients without clear indications has been questioned due to lack of robust evidence supporting its benefit in those cases.

⇒ Long-term, unnecessary use of vitamin B6 can lead to potential adverse effects, including neuropathy at high doses. Furthermore, over-prescribing vitamins contributes to increased healthcare costs without clear clinical benefits.

WHAT THIS STUDY ADDS

⇒ This study offers practical insights into implementing a vitamin B6 deprescribing protocol within a community hospital.

⇒ It demonstrates that clear guidelines and interprofessional collaboration can effectively reduce unnecessary vitamin supplementation, providing a model for adoption by other institutions.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings from this study support policies promoting evidence-based deprescribing practices as a standard of care. These policies could reduce medication costs, mitigate potential side effects from over-prescription and improve patient safety on a broader scale.

PROBLEM

The Singapore Health Science Authority issued a safety alert regarding high-dose vitamin B6 and the risk of peripheral neuropathy in its May 2023 Adverse Drug Report news bulletin.[1] Peripheral neuropathy has been reported following chronic consumption of high-dose (>100 mg/day) vitamin B6, although the precise dose–response relationship and duration threshold are not clearly established.[2]

In Singapore, adverse events related to complementary health products, including vitamin B6, have been documented. A study analysing reports submitted to the Health Sciences Authority of Singapore from 1998 to 2009 highlighted that adverse events from complementary medicines and health supplements, including vitamin B6, constituted approximately 3.8% of the total adverse events reported during that period.[3] Globally, a study from the Dutch Spontaneous Reporting System noted a significant number of neuropathy reports linked to high doses of vitamin B6, leading to regulatory actions to lower the maximum daily dose.[4]

Outram Community Hospital (OCH) is a step-down facility, serving one of the largest tertiary institutions in Singapore. OCH receives patients transferred from the acute hospital for rehabilitation and subacute care. There are 12 wards

in service, with more than 300 community hospital beds.

While OCH did not formally track vitamin B6 deprescribing rates, our team estimated that it was rarely deprescribed in our setting. To obtain baseline data, a prospective case note review was conducted for all patients in OCH in June 2024. This review identified that only 15.2% of eligible patients had their vitamin B6 deprescribed during the stay, highlighting a pressing need for improvement.

The project team recognised that factors like high patient load, high turnover and staffing issues likely contributed to the low baseline deprescribing rate. However, they believed that systems and processes could be improved for this patient group.

Hence, the project team aimed to achieve a 50% deprescribing rate of vitamin B6 for eligible patients within 4 months of the project period.

BACKGROUND

The 2020 National Population Health Survey revealed an increase in the number of Singapore residents diagnosed with chronic conditions, including hypertension, hyperlipidaemia and obesity, compared with 2017.[5] The increasing prevalence of chronic diseases among the elderly often leads to the use of multiple medications, known as polypharmacy. Polypharmacy, defined as regular use of at least five medications, increases the risk of adverse medical outcomes.[6] A study conducted in Singapore nursing homes found that 58.6% of residents were on polypharmacy. This study involved 454 residents and highlighted that polypharmacy was significantly associated with inappropriate medication use, which was observed in 70% of residents.[5] Given the vulnerability of the elderly population to adverse medical outcomes, deprescribing—a process of systematically reducing unnecessary medications—has emerged as a crucial strategy to reduce polypharmacy.

Vitamin B6 is a water-soluble vitamin that is naturally present in many foods. It is a crucial coenzyme that performs a wide variety of functions in the body.[7] The main indications for vitamin B6 include vitamin B6 deficiency and prophylaxis or treatment against isoniazid-induced peripheral neuropathy. It is also used in gestational nausea and vomiting, certain metabolic disorders such as homocystinuria, and causes of dietary deficiency due to malabsorption syndromes or chronic illnesses. However, chronic administration of high doses of vitamin B6 can cause severe and progressive sensory neuropathy characterised by ataxia.[8–11] Symptom severity appears to be dose dependent, and the symptoms usually resolve if the patient discontinues the vitamin B6 supplements as soon as neurological symptoms appear. Other effects of excessive vitamin B6 intake include painful, disfiguring dermatological lesions, photosensitivity and gastrointestinal symptoms such as nausea and heartburn.[12 13]

MEASUREMENT

The study population consisted of hospitalised patients who were prescribed vitamin B6 during their admission. Inclusion criteria encompassed patients who had no clear ongoing indication for vitamin B6, making them eligible for deprescribing. Patients who required long-term vitamin B6 therapy were excluded from the study.

For all patients discharged from OCH who were taking vitamin B6, our pharmacists collected information including patient demographics, indication of vitamin B6 and eligibility for deprescribing. Our team also assessed the percentage of eligible patients who had vitamin B6 deprescribed and calculated the associated cost-savings.

The percentage of eligible patients successfully deprescribed vitamin B6 on discharge was defined as:

$$\frac{\textit{Successfully deprescribed vitamin B6 in eligible patients}}{\textit{All eligible patients on vitamin B6 for deprescribing}} \times 100\%$$

The percentage of eligible patients successfully deprescribed vitamin B6 at discharge was subsequently plotted on a run chart.

The project team collected baseline data for 7 weeks, and an additional 9 weeks after the first plan–do–study–act (PDSA) cycle.

The cost-savings analysis was conducted by calculating the reduction in vitamin B6 prescriptions before and after the implementation of the deprescribing initiative. The total number of prescriptions was multiplied by the cost per unit of vitamin B6 to estimate the financial impact over a year.

DESIGN

A quality improvement team was formed, consisting of key stakeholders such as physicians and pharmacists and a quality improvement advisor.

To better understand the existing deprescribing workflow and identify areas for improvement, we used a swimlane diagram (online supplemental file) to map out the deprescribing process.[14] This visual tool allowed us to delineate the roles and responsibilities of different stakeholders, including physicians, pharmacists and nurses, within the deprescribing workflow. By analysing this diagram, we identified key decision points where deprescribing interventions could be effectively introduced, such as during medication reconciliation and discharge planning.

Additionally, we employed a cause-and-effect diagram to systematically identify the underlying barriers to deprescribing vitamin B6. Through brainstorming sessions with key stakeholders, we categorised potential challenges into themes such as lack of standardised guidelines, limited awareness among prescribers, high patient turnover and absence of deprescribing prompts in electronic medical records (EMR). Using objective data obtained through interviews and questionnaires, we were able to prioritise the most significant barriers, hence guiding the development of targeted interventions, such as the deprescribing algorithm and pharmacist-led medication reconciliation.

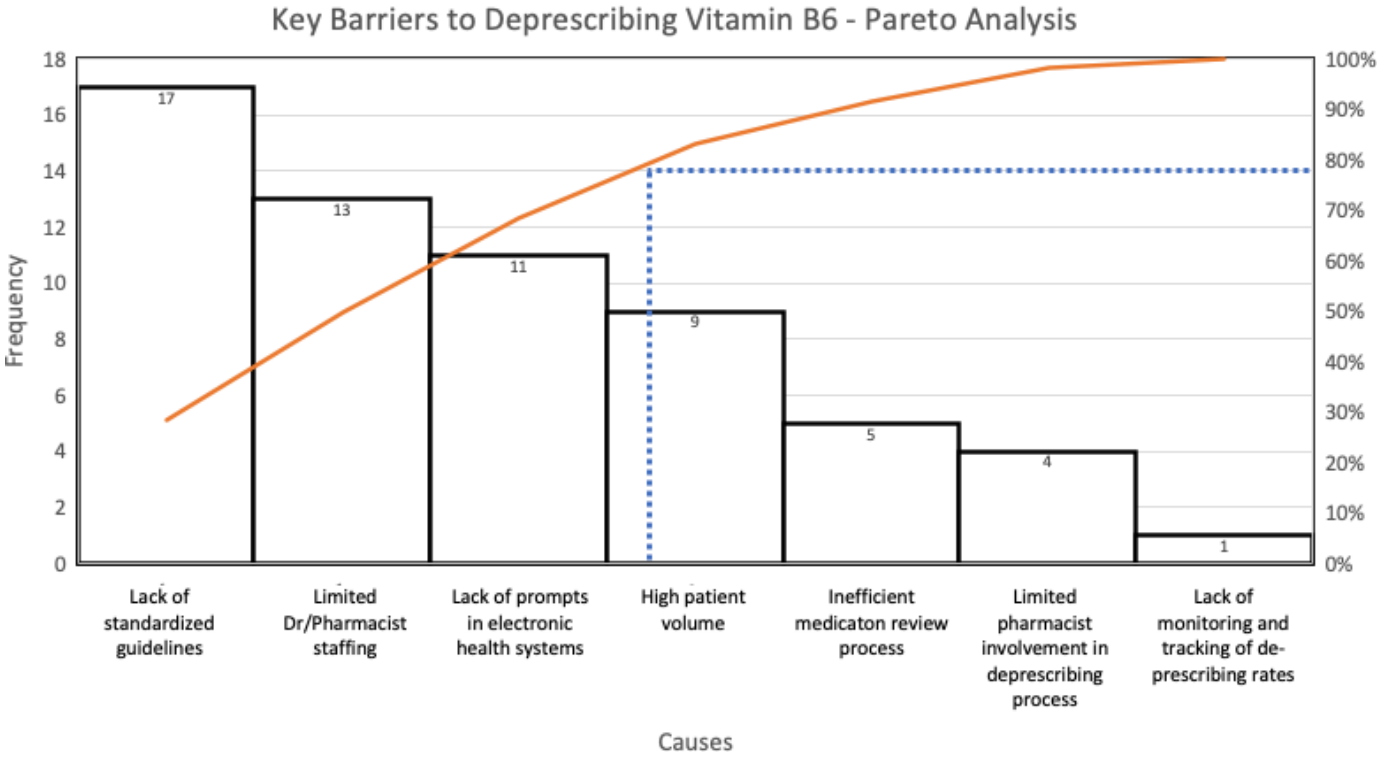


Figure 1 Significant factors regarding barriers for deprescribing vitamin B6 based on Pareto principles.

The team used various communication channels and methods. The team met up face to face three times during the project, with each meeting lasting 30 min to 1 hour. The purpose of the first meeting was to discuss problems, address issues, set goals, brainstorm ideas and build rapport. Subsequent meetings focused on trouble-shooting problems and providing updates on current performance. In addition, the team also communicated asynchronously once a week via an online messaging system, requiring team members to spend approximately 3 min per week, with the team leader providing updates on current performance.

STRATEGY

Using Pareto's principle, we identified the significant barriers for deprescribing of vitamin B6 as: (1) lack of standardised guidelines; (2) limited doctor and pharmacist staffing; (3) lack of prompts in electronic health system; and (4) high patient volume. This is shown in figure 1.

We applied the PDSA methodology in our work, a well-established framework for iterative quality improvement. The PDSA approach allowed us to test small changes, assess their impact and refine our interventions to enhance deprescribing practices effectively. This methodology has been widely recognised for its ability to drive sustainable improvements in healthcare settings, making it particularly suitable for our project. By systematically evaluating each cycle, we ensured that our process became more efficient, reducing barriers and integrating deprescribing into routine workflows.

Change idea 1

Our first intervention was to create a vitamin B6 deprescribing algorithm for doctors and pharmacists (figure 2). An educational session was conducted to raise clinician awareness of the potential adverse drug reactions associated with vitamin B6 use. This session included a presentation, informational materials highlighting symptoms of vitamin B6 toxicity and evidence-based deprescribing strategies. In our first PDSA 1.1, the feedback received was that this deprescribing algorithm did not include specific groups of patients, such as orthopaedic cases, where patients were prescribed a fixed duration of vitamin B6 postoperatively but were continued indefinitely on discharge.

In the second PDSA 1.2 cycle, a revised deprescribing algorithm was established whereby for orthopaedic patients admitted with ongoing vitamin B6 supplementation, physicians were required to input a predetermined stop date in the admission prescription. This intervention aimed to systematically address the continuation of potential unnecessary vitamin B6 supplementation and to facilitate appropriate deprescribing practices. The revised deprescribing algorithm was shared with the medical and pharmacy department.

Change idea 2

Our second change idea was to incorporate the process of deprescribing into the medication reconciliation. On discharge, pharmacists would review the list of medications and use the deprescribing algorithm to see if the patient's vitamin B6 was still indicated. If vitamin B6 was

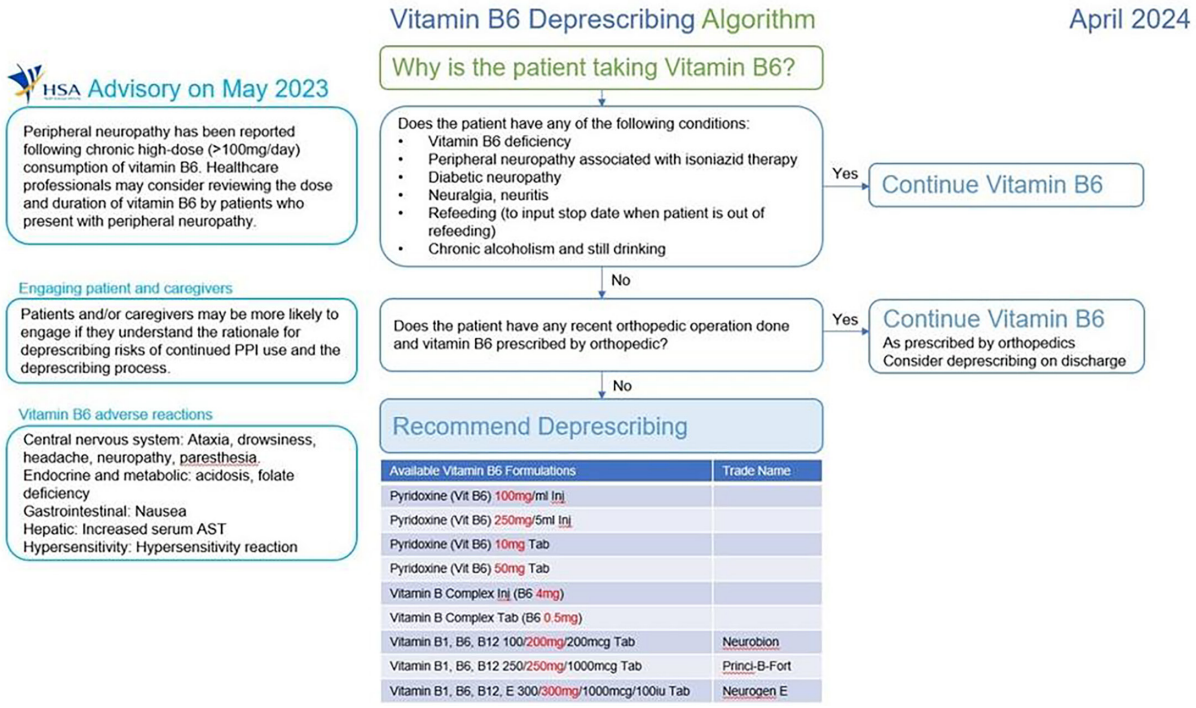


Figure 2 Vitamin B6 deprescribing algorithm. PPI, Proton pump inhibitor; AST, Aspartate aminotransferase.

not indicated, pharmacists will put up an intervention for physicians to deprescribe. In the first PDSA 2.1, feedback received was that it was challenging to find out the indication of vitamin B6 for patients, especially for those who were on the medication for a long time, as time was required to trace through previous clinical documentation to search for the indication.

In our second PDSA 2.2, our team seeks to improve the efficiency of searching for the indication of vitamin B6. We organised a sharing session with the pharmacists to provide guidance on improving the efficiency of search methods. Through a search function in the dispensed medications of patients, the date where vitamin B6 was initiated was identified. The date was subsequently matched to the clinic visit, where the indication of vitamin B6 was obtained.

Patients played a key role in the deprescribing process through education and shared decision-making. During medication reconciliation, pharmacists and physicians engaged patients in discussions about the potential risks of prolonged vitamin B6 use, including the risk of neuropathy. Patients were encouraged to participate actively in decisions regarding deprescribing, ensuring that they understood the rationale and felt comfortable with the process. Additionally, caregivers were involved when necessary, particularly for elderly patients or those with cognitive impairment, to ensure adherence to deprescribing recommendations post discharge.

RESULTS

Our primary outcome measure was the percentage of eligible patients with successful vitamin B6 deprescription at discharge OCH (figure 3). We collected baseline data from week 1 to week 7. We started PDSA 1 on week 7, PDSA 2 on week 8, PDSA 3 on week 9 and PDSA 4 on week 10.

Before intervention, the total number of eligible patients for deprescribing was 33. The total patients deprescribed was 5. The percentage of successfully deprescribed patients was 15.2%.

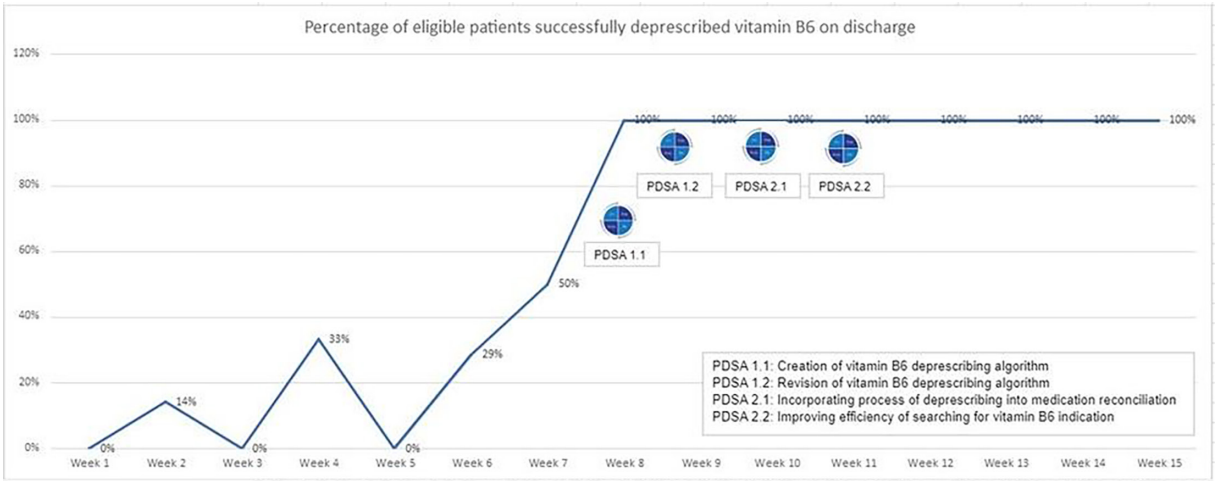
After intervention, the total eligible patients for deprescribing were 27. The total patients deprescribed was 27. The percentage of successfully deprescribed patients was 100%.

Regarding the benefits to stakeholders, deprescribing resulted in patients experiencing a reduced pill burden, fewer side effects and lower medication costs. For pharmacy staff, it meant a reduction in the amount of medication to be prepared for discharge, saving time and resources. For caregivers, the reduction in pills translated to less time spent on medication preparation.

The additional 22 patients who had vitamin B6 deprescribed amounted to cost-savings of SGD 1686 per year. The projected savings over 1 year based on the current rate of deprescribing can be estimated to be SGD 13 567 per year.

LESSONS AND LIMITATIONS

The deprescribing of vitamin B6 in a community hospital presents several valuable insights into the challenges and benefits of deprescribing protocols. One of the key lessons learnt is the importance of multidisciplinary collaboration between the medical and pharmacy teams. Through education of clinicians on the risks of unnecessary vitamin



	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15
Percentage of eligible pateitns successfully deprescribed vitamin B6	0%	14%	0%	33%	0%	29%	50%	100%	100%	100%	100%	100%	100%	100%	100%
Number of patients on vitamin B6	18	13	5	6	6	7	5	5	3	15	3	3	8	2	20
Number of eligible patients for deprescribing	7	7	3	3	4	7	2	3	2	9	3	1	2	2	5
Number of patients successfully deprescribed vitamin B6	0	1	0	1	0	2	1	3	2	9	3	1	2	2	5

Figure 3 Run chart of percentage of eligible patients successfully deprescribed vitamin B6 on discharge. PDSA, plan–do–study–act.

B6 supplementation and providing clear deprescribing criteria was essential to achieving buy-in and promoting adherence to the new guideline. This multidisciplinary approach is well supported by existing literature on healthcare improvement.[15] The diverse perspectives brought by each discipline contributed to a more robust intervention design. This synergy of expertise not only improved the effectiveness of our deprescribing initiative but also fostered a culture of shared responsibility for patient safety.

Another lesson was the importance of standardisation in reducing variation in clinical practice. Our implementation of standardised guidelines for vitamin B6 deprescribing led to more consistent and evidence-based decision making among healthcare providers. This observation aligns with the existing literature on quality improvement in healthcare. For instance, a study by Panteli *et al*[16] demonstrated that clinical practice guidelines can effectively improve care processes and patient outcomes by reducing unwarranted variations in practice. In our case, the standardised approach not only streamlined the deprescribing process but also enhanced patient safety by ensuring a uniform, evidence-based approach to managing vitamin B6 deprescribing across our community hospital setting.

The STOPP/START criteria, widely used in the UK, provide a structured approach to identifying potentially inappropriate medications for older adults and recommending beneficial treatments that may be missing. Compared with our deprescribing guideline, while the STOPP/START criteria offer a more comprehensive, evidence-based checklist applicable across multiple drug classes, our initiative focuses specifically on vitamin B6, incorporating targeted interventions and PDSA cycles to improve prescribing practices within a hospital setting. While the STOPP/START criteria serve as a general guide for deprescribing in older populations, our article's methodology provides a practical, real-world application within a quality improvement framework.

To ensure the long-term sustainability of this deprescribing initiative, several strategies have been implemented. First, the deprescribing algorithm has been formally integrated into the hospital's medication reconciliation process, making it a standard part of pharmacists' and physicians' workflows. Second, ongoing education sessions have been established to reinforce the importance of deprescribing unnecessary medications. Regular audits can be conducted to monitor compliance and effectiveness, ensuring that deprescribing remains a sustained and integral practice within the institution.

There are several limitations that may have an impact on our findings. First, patients in OCH stay for approximately 1 month, and we cannot track long-term effects of deprescribing after patients are discharged, due to patient privacy laws. Tracking any adverse effects or represcriptions of vitamin B6 over a more extended period would provide a more comprehensive understanding of the intervention's effectiveness and safety. For future quality improvement projects, we could consider collaborating with step-down care providers to evaluate the impact of deprescribing vitamin B6 on patient outcomes in the long term.

Second, the single-hospital setting may limit the generalisability of our findings to other healthcare institutions, especially those with differing patient demographics or resource availability. In our next steps, we will consider spreading our efforts to other community hospitals in Singapore.

CONCLUSION

This quality improvement initiative to deprescribe vitamin B6 in a community hospital demonstrated that reducing unnecessary vitamin supplementation among patients is feasible and has potential benefits. This project successfully reduced the routine use of vitamin B6 by establishing clear deprescribing criteria, promoting interprofessional collaboration and enhancing patient education.

While this initiative provided key lessons regarding implementation and highlighted the importance of clinician and patient engagement, limitations such as the short time frame and limited follow-up data suggest that further study is needed to fully understand the long-term impact of deprescribing on patient outcomes. Despite these limitations, the project underscored the importance of evidence-based deprescribing practices to minimise unnecessary medication use, reduce costs and improve patient safety.

Future work could expand the deprescribing framework beyond vitamin B6 to other potentially inappropriate medications commonly encountered in clinical practice. This includes integrating deprescribing protocols into hospital-wide EMR to automate medication review and flag potentially unnecessary prescriptions. Additionally, the long-term outcomes of deprescribing interventions can be explored by tracking patient adherence post discharge and assessing any unintended consequences. At last, stakeholder engagement remains a key priority, and we intend to collaborate with more healthcare professionals, including physicians, pharmacists and nurses, to foster a culture of deprescribing and ensure sustained impact.

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ORCID iD

Alvin Shao Qiang Ong http://orcid.org/0009-0004-0883-9326

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