Medication incidents involving immunosuppressive agents

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Immunosuppressive agents or immunosuppressants are a class of medications indicated for their immunomodulatory effects on autoimmune disease progression. They are typically cautiously prescribed due to their unique dosing regimens and broad spectrum of potential drug interactions. Their overall complexity and therapeutic role, while important, can cause significant patient harm when used incorrectly due to medication errors. The Institute for Safe Medication (ISMP) has identified immunosuppressant agents (such as Azathioprine, Cyclosporine, Tacrolimus) as high-alert medications in community/ambulatory settings. A list of high-alert medications in community/ambulatory settings is available at https://www.ismp.org/recommendations/high-alert-medications-community-ambulatory-list

At ISMP Canada, we conducted a multi-incident analysis on medication incidents involving immunosuppressants in community pharmacy practice. All relevant medications of interest were extracted according to the American Hospital Formulary Service (AHFS) classification system from the American Society of Health-System Pharmacists. The list included Azathioprine, Cyclosporine, Mycophenolate, Sirolimus, and Tacrolimus. Intravenous immunosuppressants were excluded from this analysis as they are not typically prescribed/dispensed in the community/ambulatory setting. All medication incident data were gathered from the ISMP Canada's Community Pharmacy Incident Reporting (CPhIR) program from a five-year period between January 2010 and May 2015. Three main themes and five sub-themes were realized from this qualitative, multi-incident analysis.

MAIN THEME 1: WRONG INDICATION

Given the plethora of drug names on the market, comparable or similar drug products were often prescribed and/or dispensed for the wrong indication. Immunosuppressants are no exception to this, with contributing factors such as look-alike/sound-alike drug names and similar formulation titles perpetuating these errors. An example of a mediation incident involving wrong indication was that of Azathioprine, whose brand name is Imuran®, being mistakenly read as Januvia®, a medication used for diabetes. As well, extended-release Tacrolimus, which is branded under Advagraf®, was commonly mistaken for Prograf®, the immediate-release formulation. Through this multi-incident analysis, we identified the underlying contributing factors to these incidents and recommended system-based solutions to help prevent future errors (Table 1).

MAIN THEME 2: EFFECTIVENESS

The theme of effectiveness refers to medication incidents that were due to under-dosing of the medication. Immunosuppressants are prescribed under a wide range of therapeutic dosing schedules and it is crucial to confirm the indicated dose with prescribers and/or patients at each stage of the mediation-use process. An example of a medication incident involving under-dosing of Mycophenolate 1000 mg twice daily, i.e. a total daily dose of 2000 mg, being dispensed as Mycophenolate 500 mg with instructions to take two tablets once daily, i.e. under-dosing by 50 per cent of the original intended total daily dose. Table 2 summarizes recommended solutions to prevent these incidents.

Table 1.
Recommendations for Prevention of Wrong Indication Related Medication Incidents

Sub-themes	Potential Contributing Factors	Recommendation
Look-alike/ Sound-alike (LASA) Drug Names	Handwritten prescriptions Confirmation bias	Utilize electronic prescription order sets Perform independent double checks in the medication-use process Request prescribers to include indication on prescription orders Gather information from patients during counselling and monitoring of drug therapy
Formulation Mix-up	Knowledge gaps Confirmation bias	Implement computerized alerts and reminders for high-alert drugs Relocate or segregate LASA drug pairs in storage areas to prevent association by proximity

MAIN THEME 3: SAFETY

Medication incidents involving safety concerns are critical issues to address with any class of medications, especially immunosuppressants. The potency of immunosuppressants may lead to severe harm in patients when toxicity occurs due to either over-dosing or drug interactions. Toxic effects can range from secondary infections to bone marrow suppression and blood dyscrasias, all of which can be fatal. Clinicans should remain vigilant regarding dosing instructions and confirm that they are safe and appropriate for the patient. Any marginal errors may easily result in over-dosing and elevated serum levels of the immunosuppressant. Table 3 summarizes recommendations to prevent safety related medication incidents.

Medication incidents highlight the vulnerability of our current healthcare system regarding the use of high-alert medications such as immunosuppressants and many others. The recommendations provided here is a starting point for healthcare practitioners to share and generate more open discussions regarding medication incidents, with an ultimate goal to provide safe and effective patient care. H

Table 2.
Recommendations for Prevention of Effectiveness Related Medication Incidents

Sub-themes	Potential Contributing Factors	Recommendation
Under-dosing	Confirmation bias Reliance on mental calculations	Perform independent double checks in the medication-use process Implement rules and policies for handling high-alert medications (e.g. documenting calculations on prescriptions during order-entry)

Table 3.
Recommendations for Prevention of Safety Related Medication Incidents

Sub-themes	Potential Contributing Factors	Recommendation
Toxicity Due to Over-dosing	Lack of independent double checks Lack of patient-practitioner communication Knowledge gaps	Perform independent double checks in the medication-use process Engage in counselling and follow-up conversations with the patient to address potential misuse of medications and ensure compliance
Toxicity Due to Drug Interactions	Lack of patient-practitioner communication among multiple healthcare providers in the patient's circle of care Incomplete continuity of care (e.g. lack of medication reconciliation at the transition points of care)	Encourage regular communication amongst healthcare providers within the patient's circle of care whenever changes are made to a patient's drug therapy Encourage patients to pick up medications from the same pharmacy for consolidated and comprehensive medication profiles

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