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Adaptation of an existing hospital pharmacist's clinical activity logbook for Canadian clinical pharmacy key performance indicator reporting

Burguière J, Floutier M, Lebel D, Fernandes O, Bussières JF

Justine Burguière, D. Pharm., Assistante de recherche, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Montréal, Québec, Canada

Marine Floutier, candidate D. Pharm., Assistante de recherche, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Montréal, Québec, Canada

Denis Lebel, B.Pharm., M.Sc., F.C.S.H.P., Chef-adjoint, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Professeur titulaire de clinique, Faculté de pharmacie, Université de Montréal, Montréal, Québec, Canada

Olavo Fernandes, Pharm.D., Director – clinical, Pharmacy Department, University Health Network, Toronto, Ontario, Canada

Jean-François Bussières, B.Pharm., M.Sc., M.B.A., F.C.S.H.P., F.O.P.Q., Chef, Unité de recherche en pratique pharmaceutique, Département de pharmacie, CHU Sainte-Justine, Professeur titulaire de clinique, Faculté de pharmacie, Université de Montréal, Montréal, Québec, Canada

Pour toute correspondance : Jean-François Bussières, CHU Sainte-Justine, Montréal, Québec, Canada, H3T1C5 – 514.345.4603 - jean-francois.bussieres.hsj@ssss.gouv.qc.ca

Introduction

The management of pharmacy departments includes the collection of professional workload measurement indicators, their analysis over time and, where possible, their comparison with those of other local, provincial and national institutions [1-9].

The tracking and documentation of clinical, operational and other professional activities as well as the measurement of the workload in a pharmacy department was first described in the 1980s [10].

In 2013, a collaborative of hospital pharmacists from across Canada, developed a core set of eight clinical pharmacy key performance indicators (cpKPI) [11-14]. The implementation of these cpKPI was intended to "improve the quality of care, advance clinical pharmacy practice toward desired evidence-informed patient outcomes, define minimum standards, permit benchmarking within and between organizations and elevate professional accountability and transparency"[13]. The cpKPI also capture important elements of the pharmacy department's workload measurement.

Most pharmacy departments have existing key performance indicators and local tracking tools. Each hospital requires a practical systematic and sustainable process to track these KPIs on a regular basis. However, there is no governmental (Provincial Ministry of Health and/ or Health Canada) consensus on which pharmacy KPI should be reported, either for drug distribution, clinical services, teaching, research or management. The Hospital Pharmacy in Canada report, which represents national survey data from selected Canadian hospitals meeting certain criteria, reflects collection of data over the last four decades.

Our centre implemented a pharmacist's logbook for the clinical activities in 1998 [15]. The logbook entries are aggregated in our department dashboard. These tracked metrics are useful to internally monitor the evolution of pharmaceutical practice and to facilitate care program comparisons. The pharmacist's activity logbook tracks some information associated with selected cpKPIs. The definitions and presentation of the data collected in the pharmacist's activity logbook are slightly different from the national cpKPI definitions. Prior to this study, we could not match data from our dashboard directly to each of the eight (8) cpKPIs.

We set out to describe our experience integrating the collection of these metrics into our existing processes and report on 5 years' worth of data. Our primary objective was to adapt our existing hospital pharmacist's clinical activity logbook and extract relevant data to calculate national cpKPIs.

Description of the initiative

The initiative was conducted at a 500-bed maternal-child university hospital. Our pharmacy department has 36 full-time equivalent pharmacists. We provide decentralized pharmacy care (104 hours per week) in 30 inpatient care programs and 28 outpatient care programs. Pharmaceutical services include the validation of drug prescriptions before they are distributed to the units and administered to patients and the validation of sterile and non-sterile compounded doses. Decentralized pharmacists provide pharmaceutical care within patient care programs. Teaching services include training activities for technical staff, pharmacists, pharmacy students and residents, and other healthcare professionals. Research services include both clinical and evaluative research activities.

The pharmacist logbook

A previous publication outlines the policy, procedures and also describes the use of the pharmacist' logbook with metric definitions [15]. (Figure 1).

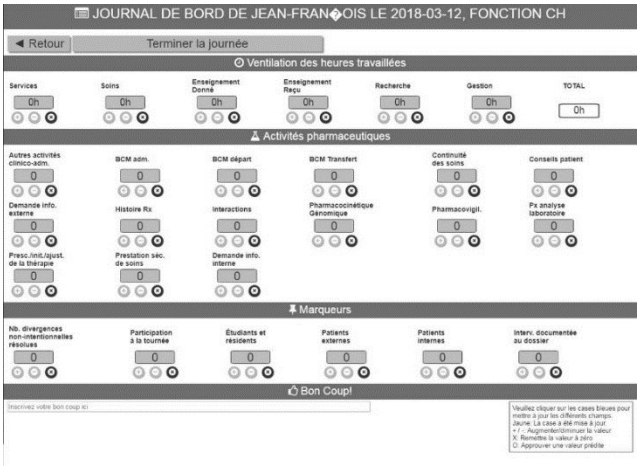

Figure 1 Online pharmacists' logbook used in our center

Legend : Services= centralized pharmaceutical services, Soins= decentralized pharmaceutical care, Enseignement donné= teaching (given), Enseignement reçu= teaching (received), Recherche= research, Gestion= management, Autres activités clinico-adm= other activities, BCM adm.= medication reconciliation on admission, BCM départ= medication reconciliation at discharge, BCM transfert= medication reconciliation at in-house transfer, Continuité des soins= continuity of care with community pharmacists, Conseils patient= patient education at discharge, Demande info externe= external requests, Histoire Rx= best possible medication history, Interactions= interaction management, Pharmacocinétique Génomique= pharmacokinetic/genomic management, Pharmacovigil.= pharmacovigilance management, Px analyse laboratoire= lab tests management, Presc./init./ajust. de la thérapie= prescribing/adjusting drug therapy, Prestation séc. de soins= medication safety management, Demande info. interne= internal requests, Nb. Divergences non-intentionnelles résolues= resolved medication discrepancies, Participation à la tournée= interprofessional patient care rounds, Étudiants et résidents= student-days, Patients externes= outpatient follow-up, Patients internes= inpatient follow-up, Interv. documentée au dossier= written interventions.

The metrics are divided into three categories (e.g. worked hours per day per axis of pharmaceutical activity (n=6), pharmaceutical activities (n=15), markers (n=5) and a "good shot of the day". Over time, the logbook has been enhanced to measure the overall clinical pharmacists' workload. In 2014, changes were made to reflect Canadian cpKPIs.

The logbook is either completed online by the pharmacist through a web interface at the end of their shift; alternatively, it can be completed manually on a datasheet that is re-transcribed by a clerk periodically. The data collected is cumulative per workday and contains only cumulative daily de-identified data provided as a count of patients and activities; this data is tied to the date and the function of the pharmacist. The logbook is designed to enter data quickly at the end of a shift regardless of the function. The logbook is used for both inpatient and outpatient pharmaceutical activities.

Data extraction

To describe our initiative and the calculation of cpKPIs, data from the pharmacist' logbook were extracted from a local SQL database for five consecutive fiscal years (e.g. from 2014-2015 to 2018-2019). We included the inpatient services (e.g. medicine, surgery, gynecology and obstetrics, neonatal intensive care, pediatric intensive care and oncology) and excluded outpatient services (e.g. outpatient pneumology/cystic fibrosis for instance) as cpKPI were calculated on a per admission basis. Data from pharmacy residents were excluded because the data they submit may duplicate the data provided by the pharmacist responsible for their supervision and were not collected systematically for the study period. Volume of patients (e.g. admissions, transfers and discharges) were extracted from a periodical spreadsheet provided by the bureau of admissions.

Calculations for select cpKPI incorporated

Three locally tracked indicators were considered similar to three of the cpKPIs (admission medication reconciliation, discharge medication reconciliation and patient education at discharge). A fourth cpKPI (DTPs resolved) was derived and estimated from existing metrics tracked in the logbook. We used the following calculation (resolved drug therapy problems (DTP) per admission = interaction management (n) + pharmacokinetic management (n) + pharmacovigilance management (n) + lab tests

management (n) + prescribing/adjusting drug therapy (n) + medication error management (n) + resolved medication discrepancies (n) + problems related to drug history (n)). It is possible other DTPs were identified by pharmacists and not captured in this equation. Since pharmacists count interventions, not results, it is also possible that a situation takes more than one intervention to be "resolved" and could then be counted more than once.

Four cpKPIs could not be reasonably estimated from the existing pharmacist's logbook framework (i.e. comprehensive direct patient care bundle, interprofessional patient care rounds, patient education during hospital stay and the pharmaceutical care plan) and were excluded from the analysis.

Evolution of cpKPI over a 5-year period

Table 1 presents pharmacists' logbook raw data from 2014-2015 to 2018-2019 and how time is spent by pharmacist.

Table 1 Pharmacists' logbook raw data from 2014-2015 to 2018-2019

Domains	Activities *	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Reported working days (n)		6 951	7 878	8 202	7 784	7 974
Time distribution	Centralized pharmaceutical services (h)	21 006	23 939	25 292	24 621	25 927
	Decentralized pharmaceutical care (h)	24 967	29 067	29 782	28 554	29 528
	Teaching (given) (h)	2 651	3 129	3 148	2 983	2 727
	Teaching (received) (h)	1 215	1 478	1 562	1 188	978
	Research (h)	2 066	2 806	3 367	2 959	2 453
	Management (h)	6 934	6 262	6 498	5 560	5 635
	Total (h)	58 838	66 682	69 649	65 865	67 248
Patients' follow-up	Inpatient follow-up (n)	53 176	57 389	55 753	64 790	60 480
	Outpatient follow-up (n)	13 556	12 555	11 192	11 726	10 629
	Total (n)	66 732	69 944	66 945	76 516	71 109
Information requests	Internal drug information requests (n)	30 791	36 992	41 091	41 145	37 569
	External drug information requests (n)	13 262	13 820	12 864	12 460	12 780
	Total (n)	44 053	50 812	53 955	53 605	50 349
Pharmaceutical interventions	Medication Reconciliation on admission (n)*	7 118	8 337	10 097	10 335	10 793
	Medication Reconciliation at Discharge (n)*	2 254	1 871	1 135	1 796	2 435
	Medication Reconciliation at in-house transfer (n)	351	334	310	688	1 056
	Continuity of care (n)	10 630	12 868	15 444	15 671	14 053
	Patient Education at Discharge (n)*	7 285	6 317	7 157	7 678	7 532
	Best possible medication history (n)	2 007	2 370	2 376	3 017	3 722
	Interaction management (n)*	1 287	1 390	1 520	1 835	1 975
	Pharmacokinetic management (n)*	2 522	2 447	2 876	3 019	2 674
	Pharmacovigilance management (n)*	2 771	3 796	3 927	4 942	3 252
	Lab tests management (n)*	3 465	3 786	4 630	6 865	9 173
	Prescribing/adjusting drug therapy (n)*	61 765	75 710	82 149	90 387	97 078
	Medication error management (n)*	3 630	3 373	4 058	3 359	4 146
	Resolved medication discrepancies (n)*	2 905	2 787	2 037	1 920	3 105
	Other activities (n)	4 795	5 023	8 150	7 916	8 668
	Total (n)	11 2785	13 0409	145 866	159 428	169 662
	Interprofessional Patient Care Rounds (h)	4 729	5 609	6 588	6 652	6 041
	Proportion of interventions being written (%)	8,58%	34,85%	32%	27,20%	34,37%
Students	Student-days (d)	2 675	2 870	3 098	2 488	2 298

* While key outpatient pharmacist functions were excluded, oncology was considered even if it included both inpatient/outpatient activities

Table 2 presents the four cpKPI from 2014-2015 to 2018-2019.

Table 2 – Four cpKPI from 2014-2015 to 2018-2019

Financial years	Patient care programs	Number of Medication Reconciliation on admission per admission*	Number of Medication Reconciliation at discharge per admission	Number of Resolved Drug Therapy Problems per admission	Number of Patient Education at Discharge per admission**
2014-2015					
2014-2015	Medicine	0.27	0.12	1.67	0.27
	Surgery	0.12	0.01	3.65	0.06
	Ob-gyn	0.13	0.01	0.36	0.20
	NICU	0.01	0.02	11.41	0.09
	Oncology	0.46	0.67	12.47	1.29
	PICU	0.39	0.04	10.16	0.72
2015-2016					
2015-2016	Medicine	0.46	0.04	1.04	0.15
	Surgery	0.17	0.01	3.81	0.05
	Ob-gyn	0.19	0.01	0.50	0.23
	NICU	0.00	0.05	19.25	0.21
	Oncology	0.69	0.61	13.26	1.22
	PICU	0.27	0.03	25.12	0.61
2016-2017					
2016-2017	Medicine	0.55	0.01	1.26	0.14
	Surgery	0.19	0.00	3.59	0.03
	Ob-gyn	0.21	0.01	0.53	0.24
	NICU	0.06	0.05	22.99	0.21
	Oncology	0.56	0.79	18.24	1.95
	PICU	0.56	0.03	38.45	0.47
2017-2018					
2017-2018	Medicine	0.62	0.04	1.53	0.17
	Surgery	0.14	0.00	3.18	0.02
	Ob-gyn	0.24	0.01	0.87	0.25
	NICU	0.47	0.38	34.16	0.52
	Oncology	0.37	0.81	19.52	0.97
	PICU	0.40	0.01	22.35	0.08
2018-2019					
2018-2019	Medicine	0.76	0.08	2.15	0.20
	Surgery	0.14	0.00	3.13	0.03
	Ob-gyn	0.39	0.02	1.13	0.36
	NICU	0.03	0.05	29.90	0.23
	Oncology	0.34	0.84	19.58	1.79
	PICU	0.86	0.43	28.85	0.68

** All oncology patients (e.g. inpatient and outpatient) should have a medication reconciliation performed; an important proportion of inpatients transit from outpatient clinic before their admission in patient care unit; therefore, these medication reconciliation are performed captured in outpatient statistics that are used to calculate inpatient cpKPI*

*** Oncology patients may receive a patient education during their or at discharge; we cannot separate these two patient education opportunities; therefore, the ratio is above 1*

Evaluation of our initiative

To our knowledge, this is the first descriptive published study of adapting and refining an existing departmental dashboard based upon a pharmacist's logbook to include the integration of cpKPIs for decentralized pharmacists' activities.

cpKPI integration

Four of the eight cpKPIs were calculated from the existing logbook metrics used at our center. For the "resolved DTP" cpKPI, eight of our original metrics were combined to estimate this more global indicator. The breakdown of specific activities was still available, but it is possible that not all DTPs were captured. Hepler and Strand defined categories of DTP which go beyond safety-related aspects: untreated indications, improper drug selection, sub-therapeutic dosage, failure to receive drugs, over-dosage, adverse drug reaction, drug interactions and drug use without indication [16].

We explicitly decided not to include the other four cpKPIs in our original implementation phase for a number of reasons. With regards to "interprofessional patient care rounds", our current logbook captures the number of hours pharmacists spend in rounds rather than the number of patients receiving this care activity. It also captures the number of patients followed per day and not only patients who are reviewed on rounds. We felt this logbook metric was more locally useful to our department at this time, as some patient care programs do not have structured interprofessional rounds.

We were unable to explicitly calculate "patient education during hospital stay" because our logbook does not include a separate item for patient education performed during hospitalization. However, our logbook tracks "patient education at discharge".

Subsequently, we did not measure the number of patients who received comprehensive direct patient care by a pharmacist in collaboration with the health care team as we were not measuring the five cpKPI required for this indicator.

For pharmaceutical care, we chose to measure "DTPs resolved" rather than the "pharmaceutical care plan". In the context of a teaching hospital, all pharmacy students and residents are required to write pharmaceutical care plans. These documents, written for clinical and educational purposes, are usually not included in the patient's file. On the other hand, pharmacists carry out pharmaceutical care to facilitate daily follow-up, continuity of care, but they are not systematically documented in the patient files. Most pharmacists use complementary tools to collect many of the elements of the care plans and it varies according to the care programs. However, this use is currently not counted.

Overall, cpKPI patient rates ranged from 0% to 86% for admission reconciliation, 0%-84% for discharge reconciliation and 2%-195% for patient education at discharge; the number of resolved drug therapy problems per admission varied between 0.36 and 34.16] [see table 2].

Issues in collecting cpKPI

Our center has been using a logbook for twenty years in our hospital. This tool is well established because the data collection is simple (e.g. easy reporting on a secured web page that can be done through the intranet at the hospital or at home), fast (e.g. a few minutes per day) and limited to the most relevant items. Any collection including a patient record number would significantly increase the collection time with the current tool (e.g. the transcription of a patient record number per intervention would require a different system to collect the data)

In the future, it may be reasonable to consider automating the collection of patient data, perhaps with a mobile application, barcodes or pre-coded for pharmaceutical activities and interventions in the patient electronic health record. The time devoted to the collection of indicators such as cpKPI should never significantly divert time dedicated to patient care. Migration to a mobile tool includes economic issues (e.g. need to develop the application in iOS and Android to be compatible with pharmacists' phones) and information security issues (e.g. need to encrypt the data to ensure confidentiality).

While it was relatively easy to collect the patient numerator (i.e. pharmacist activities based on current logbook), the collection of the patient denominator presents some pragmatic challenges when the data is not collected on a per patient-basis. The number of admitted patients varies over a day. For instance, it is possible that more than 20 patients stayed on a 20-bed unit for a given day due to high turnover. It appeared resource intensive and imprecise to ask pharmacists to count the number of patients admitted per day. To address this problem, we used the total number of admissions per year for each care program as the best estimate. We note this may be consistent with other hospitals nationally that may also use practical algorithms to derive accurate denominator estimations. Other practical questions surfaced concerning the denominator: should we count all the admitted patients or only the admitted patients targeted by the current planned level of pharmaceutical care? Should newborns be counted in a maternal-child unit? Should one-day

activities be counted (e.g. day surgery)? Should ambulatory activities be considered, knowing the cpKPIs were initially designed only for inpatients? Such practical questions should be considered by other hospitals considering the use of cpKPIs. Software vendors of admission-transfer-discharge should consider providing interfaced appropriate information with pharmacy information systems to facilitate the calculation of cpKPIs.

Limitations

We were only able to collect data for four of the eight cpKPIs. This is consistent with hospitals nationally which may select certain cpKPIs to focus on locally. The data reported comes from the custom documentation in a single maternal-child institution, which may limit generalizability to all acute care hospitals. National cpKPI were designed for inpatients and their associations to patient outcomes may not directly be extrapolated accurately to outpatients.

Conclusion

It is important to measure professional performance in hospital pharmacy. This descriptive study demonstrates that it was feasible to adapt our existing hospital pharmacist's clinical activity logbook and extract relevant data to calculate four cpKPI in a Canadian teaching hospital. The changes made affected only the data processing and the method of completion of the journal has not been modified for pharmacists. Future work is needed to capture all the cpKPIs.

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