Telepharmacist Medication Order Review: A Prospective Observational Study in Ontario Health Systems

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Background

- Except in emergency situations, current medication standards in hospitals require review of all medication orders by a pharmacist before the administration of the first dose.

- On average, hospital pharmacy services provided in Canada are 79 h/week; orders are not being reviewed by the pharmacist for over half of the time - indicating a substantial lack of pharmacist verification of orders before administration of the first dose.

- In smaller hospitals pharmacist order review occurs in 60% of prescriptions before the first dose.

- In the US, 79% of hospitals have 24/7 pharmacist order review, with 20% of those hours supported by telepharmacy; in Canada, under 5% of hospitals have 24/7 pharmacist order review.

- Telepharmacist services have demonstrated a positive impact on order review, patient safety, and healthcare costs.

Description

- A prospective observational study in which 47 telepharmacists performed remote medication order review for 25 health-care sites, ranging from 15-389 beds over 28 consecutive days from Oct 17 to Nov 13, 2017.

- Telepharmacy services included 24 hour medication order review utilizing nine different pharmacy software systems.

- Pharmacist medication order review included the following:
a) pharmacist medication order entry b) pharmacist verification of prescriber, nursing and pharmacy technician medication order entry.

Action

- Pharmacists documented the following for each drug order review shift:

  - Health care system

  - Pharmacy software system

  - Time of day

  - Day of the week

  - Number of medication orders reviewed

  - Type of pharmacist medication order review:

    - Pharmacist order entry

    - Verification of order entry by nurse, prescriber (CPOE) or technician.

  - Time required for medication order review/time block:

    - Included assessment of order appropriateness, identifying and addressing order discrepancies, and/or drug therapy problems.

Results

Table 1:   Characteristics of pharmacist order entry and pharmacist order entry review

Parameter	Orders n	Orders %	Orders Total
Type of order entry			
Pharmacist order entry	333	30.44	1094
Technician[1] order entry with pharmacist review	640	58.5	
Prescriber order entry with pharmacist review	93	8.5	
Nurse order entry with pharmacist review	28	2.56	
Weekday time slots pharmacist order entry (n=333)			
Daytime order entry	165	49.55	333
0700-1200	80	24.02	
1200-1600	85	25.53	
After hours order entry	168	50.45	
1600-2300	80	24.02	
2300-0700	88	26.43	
Weekday time slots pharmacist order entry review (n=754)			
Daytime order entry	613	81.3	754
0700-1200	341	45.23	
1200-1600	272	36.07	
After hours order entry	141	18.7	
16.00 to 23:00	99	13.13	
23:00 to 07:00	42	5.57	
Days of week pharmacist order entry (n=333)			
Weekdays			85.9%
Monday	52	15.62	
Tuesday	55	16.51	
Wednesday	65	19.52	
Thursday	64	19.22	
Friday	50	15.02	
Weekends			14.1%
Saturday	27	8.1	
Sunday	20	6.01	
Days of week pharmacist order entry review (n=754)			
Weekdays			95.5%
Monday	170	22.54	
Tuesday	140	18.57	
Wednesday	163	21.62	
Thursday	134	17.77	
Friday	113	14.99	
Weekends			4.5%
Saturday	14	1.86	
Sunday	20	2.65	
Pharmacy software used for pharmacist order entry			
Meditech Magic (DOS)	79	24	333
Meditech Client (Windows)	116	35	
Kroll	1	0.3	
Anzer	8	2.4	
Cerner	34	10.2	
Dawn AC	42	12.6	
HMM	53	15.9	
Pharmacy software used for pharmacist order entry review			
Anzer	58	7.69	754
Cerner	115	15.25	
Meditech Client (Windows)	257	34.08	
Meditech Magic (DOS)	186	24.67	
Kroll	127	16.85	
PointClickCare	9	1.19	
Worx	2	0.27	

[1] pharmacy assistant or pharmacy technician

Table 2: Time for pharmacist order entry and pharmacist order entry review by time of day, pharmacy software system and profession

	Median time per order entry (min)	Median time per order review (min)
Overall time per order entry and review	1.58	1.25
Total time per order	1.337	
Time of the day		
8 am to 12 noon	1.77	1.43
12 noon to 16:00	1.83	1.20
16:00 to 23:00	1.59	1.11
23:00 to 07:00	1.29	1.06
Daytime	1.78	1.29
After hours	1.39	1.10
Weekdays		1.25
Weekend		1.22
Pharmacy software		
HMM	1.13	
Anzer	2.00	2.07
Cerner	1.50	0.59
Meditech Magic (DOS)	1.43	1.09
Kroll	2.00	2.18
DawnAC	10.00	
PointClickCare		1.50
Worx		0.83
Meditech Client (Windows)	1.67	1.12
Time for pharmacist order entry review **per order by professionals**		
CPOE[1] with pharmacist review		0.53
Nursing OE[2] with pharmacist review		3.62
Pharmacy assistant/technician OE[2] with pharmacist review		1.31

[1] CPOE - Computer prescriber order entry, [2] OE- order entry

Table 3: Overall number of orders entered by a pharmacist and order entries reviewed by a pharmacist - time of day

Parameters	Median number of orders	Range
Number of orders entered by the pharmacist and order entries reviewed by the pharmacist – by time of day		
Weekdays		
8.00 -12.00	35.00	323
12 .00 -16:00	35.00	200
16:00 - 23:00	46.00	546
23:00 - 07:00	115.40	500
Daytime (8.00-16.00)	35	323
After hours (16.00 – 07.00)	58.5	546
Weekends		
8.00 -12.00	67.50	177
12 .00 -16:00	29.00	206
16:00 - 23:00	64.50	445
23:00 - 07:00	90.00	313
Daytime (8.00-16.00)	38.00	206
After hours (16.00 – 07.00)	84.00	445
Number of orders entered by professionals		
CPOE[1] with pharmacist review	181.00	546
Nursing OE[2] with pharmacist review	10.00	46
Pharmacy technician/assistant OE[2] with pharmacist review	40.00	323
Pharmacist OE[2]	45.00	293

[1] CPOE - Computer prescriber order entry, [2] OE- order entry

Table 4:   Comparison of pharmacist order entry and pharmacist order review characteristics

Parameters	x2	U	Significance
Comparison pharmacist order entry **time with other pharmacist order entry characteristics**			
Time per order entry	21.547		p<0.001[1]
Time of day			
Time per order entry	5.997		p=0.423
Day of week			
Time per order entry	101.486		p<0.001*
Pharmacy software used			
Time per order weekday		8466.5	p=0.694
Time per order weekend			
Time per order daytime		9764.5	p<0.001*
Time per order at night			
Comparison pharmacist order entry review time **with other pharmacist order review characteristics**			
Time per order review	16.127		p=0.001*
Time of day			
Time per order review	2.530		p=0.865
Day of week			
Time per order review weekday		17148.0	p=0.933
Time per review order weekend			
Time per order review at day		36361.0	p=0.003*
Time per order review at night			
Time per order review	170.504		p<0.001*
Pharmacy software used			
Comparison pharmacist order entry **with** pharmacist order review **characteristics**			
Order entry by pharmacist time		95386.5	p<0.001*
Order review by pharmacist time			
Order entry time review per professional	131.698		p<0.001*
Order review time			

* - p<0.05

Results

- A total of 1094 medication orders were entered by a pharmacist or, entered by professionals with pharmacist review, with an overall median time of 1.3 min/order.

- The majority of orders entered either by the pharmacist (74% weekdays, 86% weekends) or entered by a professional, and reviewed by the pharmacist (81% weekdays, 95 % weekends) were during the daytime (08:00-16:00).

- The number of orders entered on weekdays by a pharmacist was relatively consistent each day, with a slightly higher volume of orders on Wednesdays and Thursdays (65 and 64 respectively). For pharmacist review of health care professional order entry, the trend was a gradual reduction in the number of orders reviewed each day as the week progressed, highest on Mondays (170) to lowest on Fridays (113).

- Time (min/order) required for pharmacists to review professional order entry was the shortest for CPOE (0.53), compared to the pharmacy technician order entry (1.31); nursing order entry required the longest time for pharmacist review (3.62).

- The pharmacist order entry time fluctuated during the day peaking from 23:00 - 07:00 (N=88) and was significantly different between time blocks (p<0.001). Peak volume for pharmacist review of orders entered by professionals peaked from 0700-12:00 (N= 341) and was also significantly different between time blocks (p<0.001).

- Additionally, median time (min) per order for pharmacist order entry in the daytime (1.78) was significantly different (p<0.001) than median order entry time after hours (1.39).

- Significant differences were also found between the type of pharmacy software used and the median time, for both pharmacist order entry and pharmacist review of order entry by professionals (both p<0.001).

- Pharmacist speed of order entry (min/order) is the quickest on HMM (1.13), Meditech DOS (1.43) and Cerner (1.5), and pharmacist order entry review speed (min/order) is greatest when using Cerner (0.59), Worx (0.83) and Meditech Client -Windows (1.12) pharmacy software.

- The time (min/order) was greater for the pharmacist order entry (1.58) compared to review of order entry by professionals (1.25), (p<0.001).

- There was a significant difference between the time for pharmacist review of order entry and the overall time per order entry review (p<0.001).

Implications

Data on remote pharmacist drug order review workload (volume, type of order entry review, time period, software system and associated time requirements) allows healthcare leadership and telepharmacy providers in Canada to make informed decisions on human resources required to meet a key medication safety standard in hospitals - all medication orders are reviewed by a pharmacist before the administration of the first dose.