Prioritizing Pharmaceutical Activities: A Simulation Exercise

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INTRODUCTION

Hospital pharmacy practice has undergone many changes over the past 3 decades.[1-3] New technologies, such as automated repackaging, robotic unit-dose cart-fill systems, and automated dispensing cabinets, have improved the efficiency, effectiveness, and quality of drug distribution systems. In addition, new pharmacy practice models have been introduced in which pharmacists accept responsibility and accountability for managing drug therapy (e.g., pharmaceutical care, medication therapy management). There is an abundance of evidence regarding the benefits of many pharmacy services for the quality and effectiveness of health care,[4-8] but the uptake of many evidence-based services has been slow and incomplete. As such, there is a relative paucity of literature about the decision-making processes that pharmacy managers and practitioners use to prioritize the pharmacy services that they provide. Given that available human and financial resources are limited, it is important for pharmacy managers and others in the profession to identify and understand the basis for their prioritization decisions. More specifically, they need to understand if the portfolio of services provided by a particular pharmacy department is evidence-based, preference-based, or a result of random opportunities that have arisen in the hospital.

A simulation exercise was developed to examine how hospital pharmacy managers make prioritization decisions. The primary objective of the exercise was to examine the consistency of pharmacy managers' prioritization decisions in a simulated environment with constraints on available resources. The secondary objective was to rank the factors influencing prioritization decisions and to compare individuals' and teams' rankings of these factors.

METHODS

A simulated prioritization exercise was created and conducted during a symposium attended by 39 anglophone and 10 francophone pharmacy managers from all regions of Canada (the Millcroft Hospital Pharmacy Leadership Conference, held in Alton, Ontario, in June 2011). The exercise was conducted in English, with supplemental instructions provided in French for those who requested it. The pharmaceutical activities used in the exercise and their relative resource requirements were established by the research team on the basis of data from the *Hospital Pharmacy in Canada 2009/2010 Report*[9] and the team's knowledge of hospital pharmacy practice. The simulation exercise and the tools used in the exercise were pretested with a group of 6 pharmacy interns.

Each pharmacy manager was assigned to 1 of 8 groups, each of which consisted of 6 or 7 individuals. Each group was deemed to represent a virtual pharmacy department. The research team randomly identified one member of each group to act as the leader of the virtual department. This person was responsible for ensuring that the exercise was completed within the allotted time.

Each team was given the following written instructions. "You are acting as the pharmacy management team for a new 300-bed teaching hospital, which operates within a health care system that faces financial, human, and material constraints. For the purpose of this simulation, pharmaceutical practice has been divided into 5 domains: drug distribution, clinical services, teaching, research, and management. You have been given a set of 142 coloured labels, representing a total of 32 pharmaceutical activities and services (Table 1). Each label represents about the same amount of resources to be expended for that service or activity. The labels are colour-coded, according to the 5 domains of pharmacy practice: green for drug distribution, white for clinical services, red for teaching, blue for research, and brown for management. You have 30 minutes to select the pharmacy services that your department will provide. Please select, and paste on your group's posterboard, the 60 labels representing priority activities for your hospital. The 60 labels will represent all the funding that you have for pharmaceutical activities and services. You may decide to only partially implement a service (e.g., a service for only 50% of beds) or to fully implement a service (i.e., 100% of beds)."

Table 1. Labels Available for Prioritization of Activities in Hospital Pharmacy Practice*

Domain and Pharmaceutical Activity or Service	Coverage Provided by Each Label	No. of Labels Available
Drug distribution		
Unit-dose system (centralized)	10% of beds	10
Parenteral admixture service	10% of beds	10
Cytotoxic admixture and hazardous drugs	20% of beds	5
Central packaging and robotization	20% of needs	5
Automated decentralized cabinets	10% of beds	10
Order-entry validation by the pharmacist	10% of beds	10
Opening hours (hours of pharmacy operation)	20% of needs	5
Clinical services		
Decentralized pharmaceutical care		
Inpatient	10% of beds	10
Outpatient	10% of outpatient visits	10
Committees		
Pharmacology and therapeutics	100% of needs	1
Infection control	100% of needs	1
Ethics review	100% of needs	1
Medication safety	100% of needs	1
Adverse drug reaction	100% of needs	1
Other clinical		
Medication reconciliation process	10% of beds	10
Drug information centre	20% of questions	5
Evaluation of clinical pharmacy services	20% of pharmacists	5
Dependent or independent prescribing	20% of patients	5
Teaching		
Inservice education to maintain competency		
For technical staff	50% of needs	2
For pharmacists	50% of needs	2
For other health care professionals	50% of needs	2
Internship training		
Undergraduate pharmacy students	20% of needs	5
Postgraduate pharmacy students	20% of needs	5
Other teaching		
External education	50% of needs	2
Research		
Clinical trial support	50% of needs	2
Original evaluative research	20% of needs	5
Drug utilization reviews	50% of needs	2
Management		
Human resources management	50% of needs	2
Material resources management	50% of needs	2
Financial resources management	50% of needs	2
Project management	50% of needs	2
Other management needs	50% of needs	2
Total no. of options provided to each team		**142**

*Each team of pharmacy managers had to choose 60 labels.

After the teams had completed the prioritization exercise, each participant was given a list of 16 factors that might have influenced the prioritization decisions and was asked to rank the relative importance, from highest to lowest (1 to 16, respectively), of each factor in their decisions. Thereafter, the team leaders were asked to lead a group discussion of the ranking and to come up with their groups' consensus on the relative importance of each factor in the prioritization decisions. Participants were given a total of 15 minutes to perform these individual and group rankings of factors influencing prioritization decisions. The next day, a synthesis of the results was presented to the participants, followed by a discussion about decision-making in the health care sector.

Data Analysis

The primary objective, to examine the consistency of prioritization decisions made in the context of limited

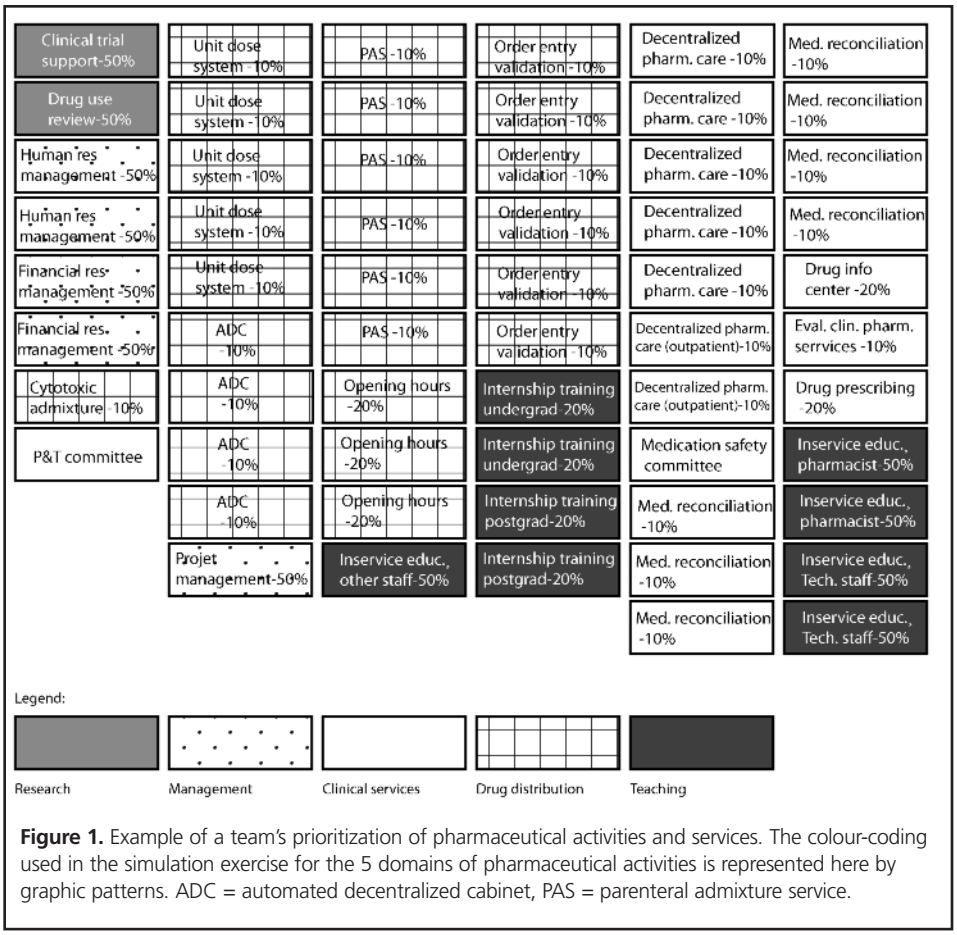

Figure 1. Example of a team's prioritization of pharmaceutical activities and services. The colour-coding used in the simulation exercise for the 5 domains of pharmaceutical activities is represented here by graphic patterns. ADC = automated decentralized cabinet, PAS = parenteral admixture service.

Table 2. Prioritization of 5 Domains of Hospital Pharmacy Practice

	Team; Relative Weight of Each Domain (No. [%] of Points)								
Domain	**Team A**	**Team B**	**Team C**	**Team D**	**Team E**	**Team F**	**Team G**	**Team H**	**Total**
Drug distribution	290 (21)	380 (27)	400 (37)	350 (23)	390 (26)	340 (28)	360 (25)	210 (14)	2720 (24)
Clinical services	400 (29)	340 (24)	350 (32)	500 (32)	470 (32)	600 (49)	490 (34)	630 (41)	3780 (34)
Teaching	330 (24)	290 (20)	40 (4)	180 (12)	330 (22)	140 (11)	140 (10)	310 (20)	1760 (16)
Research	100 (7)	70 (5)	0 (0)	120 (8)	50 (3)	0 (0)	170 (12)	70 (5)	580 (5)
Management	250 (18)	350 (24)	300 (28)	400 (26)	250 (17)	150 (12)	300 (21)	300 (20)	2300 (21)
Total*	1370 (100)	1430 (100)	1090 (100)	1550 (100)	1490 (100)	1230 (100)	1460 (100)	1520 (100)	11140 (100)

*The total number of points for each team varied according to the type of labels chosen by the team.

resources, was measured in 3 ways. First, a photo of each group's prioritization scheme was examined, and the labels from each domain were counted. This allowed calculation of the number of activities covered per team. An activity was considered to be "covered" if at least one label had been applied. Second, the relative weight attributed to each domain was calculated by dividing the total number of points attributed to a domain by the total number of points used by the team. One point was assigned for each 1% of a service covered by the labels selected. Third, the extent of coverage per activity was calculated for each team.

The secondary objective was measured by averaging the individual (n = 49) and team (n = 8) rankings for each factor that might have influenced prioritization decisions. These averages were then used to re-rank the factors from 1 to 16 for both individuals and teams. The correlation between individuals' and teams' average rankings was determined with Spearman's rank correlation coefficient. A p value less than 0.05 was considered statistically significant. A high correlation coefficient (value close to 1) points to a strongly positive relationship between individual and team rankings. A negative correlation coefficient points to a negative relationship between individual and team rankings.

For all numeric analyses, the data were entered into a Microsoft Excel 2010 spreadsheet (Microsoft, Seattle, Washington).

RESULTS

On average, the teams covered 24 ± 4 (mean ± standard deviation) of the 32 activities (Figure 1). While the majority of teams (6 of 8) prioritized more than two-thirds of the 32 suggested pharmaceutical activities, 2 of the teams prioritized fewer activities (18/32 and 16/32, respectively) to allow more comprehensive coverage of those services that they did decide to provide.

Averaged over all 8 teams, the relative weights attributed to each domain of pharmacy practice were 34% for clinical services, 24% for drug distribution services, 21% for management activities, 16% for teaching services, and 5% for research activities (Table 2). The extent of coverage for individual activities and services varied greatly from one team to another. For example, for 19 of the 32 activities, the range in coverage spanned more than 60 percentage points, and there were 9

Table 3. Prioritization of Pharmaceutical Activities

Domain and Pharmaceutical Activity or Service	Team; % Coverage								
	A	B	C	D	E	F	G	H	All (Mean ± SD)
Drug distribution									
Unit-dose system (centralized)	50	50	10	80	0	50	60	20	40±27
Parenteral admixture service	60	50	70	50	50	80	30	50	55±15
Cytotoxic admixture and hazardous drugs	20	100	100	100	100	100	40	20	73±38
Central packaging and robotization	0	0	0	80	40	0	60	20	25±32
Automated decentralized cabinets	40	0	60	0	60	50	40	60	39±25
Order-entry validation by pharmacist	60	100	80	0	80	0	70	40	54±37
Hours of pharmacy operation	60	80	80	40	60	60	60	0	55±26
Clinical services									
Decentralized pharmaceutical care									
Inpatient	50	60	40	50	60	90	70	50	59±16
Outpatient	20	10	80	40	10	60	20	30	34±25
Committees									
Pharmacology and therapeutics	100	100	100	100	100	100	100	100	100±0
Infection control	0	0	0	0	0	0	100	100	25±46
Ethics review	0	0	0	100	0	100	0	0	25±46
Medication safety	100	100	0	100	100	100	100	100	88±35
Adverse drug reaction	0	0	0	0	100	100	0	100	38±52
Other clinical									
Medication reconciliation process	70	30	30	10	20	50	20	30	33±19
Drug information centre	20	0	0	40	40	0	20	80	25±28
Evaluation of clinical pharmacy services	20	20	40	40	20	0	20	20	23±13
Dependent or independent prescribing	20	20	60	20	20	0	40	20	25±18
Teaching									
Inservice education to maintain competency									
For technical staff	100	100	0	0	100	0	50	100	56±50
For pharmacists	100	100	0	50	100	0	50	100	63±44
For other health care professionals	50	50	0	50	50	0	0	50	31±26
Internship training									
Undergraduate pharmacy students	40	20	20	60	40	40	20	40	35±14
Postgraduate pharmacy students	40	20	20	20	40	100	20	20	35±28
Other teaching									
External education	0	0	0	0	0	0	0	0	0± 0
Research									
Clinical trial support	50	0	0	50	50	0	100	0	31±37
Original evaluative research	0	20	0	20	0	0	20	20	10±11
Drug utilization reviews	50	50	0	50	0	0	50	50	31±26
Management									
Human resources management	100	100	100	100	100	100	100	100	100±0
Material resources management	0	100	50	100	50	0	50	50	50±38
Financial resources management	100	100	100	100	50	50	50	50	75±27
Project management	50	50	50	50	50	0	50	50	44±18
Other management needs	0	0	0	50	0	0	50	50	19±26

SD = standard deviation.

activities for which coverage ranged from 0% to 100% (Table 3).

Table 4 presents the ranking of factors influencing individual and team prioritization decisions. Spearman rank correlation coefficients between the average individual ranking and the average team ranking for each factor were as follows (listed from highest to lowest): 0.909 for Team E ($p < 0.001$), 0.826 for Team B ($p < 0.001$), 0.735 for Team C ($p = 0.001$), 0.688 for Team H ($p = 0.003$), 0.538 for Team G ($p = 0.031$), 0.418 for Team A ($p = 0.11$), 0.215 for Team D ($p = 0.42$), –0.521 for Team F ($p = 0.039$).

DISCUSSION

Most of the 8 teams of pharmacy managers involved in the simulation exercise opted to provide a wide range of services, but at a low level of comprehensiveness. The majority (6 of the 8 teams) included more than two-thirds of the 32 possible pharmaceutical activities and services in their prioritization decisions. In the complex world of health care, pharmacy leaders may feel pressured to provide a wide range of services targeted to individual patients in greatest need. For example, pharmacists may provide medication reconciliation services, but only to selected high-risk patients. The other 2 teams appeared to make a decision to focus on a smaller number of activities and services and to direct their resources to providing more comprehensive services in these areas.

The relative weights for activities and services ranged from 5% for research to 34% for clinical services (Table 2). Interestingly, the teams prioritized more clinical activities (range 24% to 49% of total points) than drug distribution activities (range 14% to 37% of total points).

Although the relative weights attributed to each pharmacy practice domain can be considered consistent, there was high variation in the coverage of individual activities or services by each team (Table 3). Among other observations, it was noted that pharmacy leaders gave high priority to human resource management (with all teams covering 100% of needs in this area) and financial management. Surprisingly, 3 of the teams chose to cover 50% of "other management needs", even though many pharmacy service needs were not prioritized by these teams. The prioritization of management needs may simply reflect the priority that managers give to their own needs or may reflect a desire to have resources available to deal with the

Table 4. Individual and Team Ranking of Factors Influencing Prioritization

Factor Influencing Prioritization*	Ranking by Individuals		Ranking by Teams	
	Average Ranking (n = 49)	Numeric Ranking Based on Average†	Average Ranking (n = 8)	Numeric Ranking Based on Average†
Perception of favourable impact of activity or service on safe provision of health care (i.e., reduction in medication errors)	4.5	2	2.6	1
Perception of favourable impact of activity or service on health outcomes (i.e., improvement or maintenance of patient's health status)	3.4	1	3.4	2
Conclusive evidence available to support decisions	6.9	3	4.9	3
Desire to comply with legislative or normative framework	7.6	4	6.0	4
Required to address audits or inspections	9.6	12	6.1	5
Leadership of person designated as department director	8.0	6	8.0	6
Perception of favourable impact of activity or service on health care expenses (i.e., optimization of costs)	8.7	9	8.0	7
Having sufficient expertise to offer activity or service	9.0	10	9.0	8
Dominant influence of a team member other than department director	9.1	11	9.9	9
Ease of implementing and maintaining activity or service	9.9	15	10.0	10
Popularity of activity or service among team members	8.6	8	10.1	11
Professional interests of team members	8.4	7	10.8	12
Management support (i.e., at financial and/or political level) or support from other stakeholders within organization	9.7	13	10.8	13
Favourable departmental (e.g., team) dynamics	7.7	5	11.4	14
Relative quantities of one item over another (i.e.. items with more labels prioritized more or less)	9.9	14	12.1	15
External pressure from media, public, or politicians (e.g., occurrence of an adverse event covered in the media; social and media pressure)	13.6	16	13.0	16

*The order of factors in column 1 reflects ranking from 1 to 16 on the basis of average team rankings (column 5).
†Ranking from 1 to 16 according to average ranking for 49 individuals or 8 teams.

unpredictable problems that inevitably arise in most pharmacy departments. Other activities that were given low prioritization included original research by members of the pharmacy department, provision of education to external groups, and provision of support for clinical trials. Of concern, pharmacy managers gave a low priority to experiential training for undergraduate students.

In the *Hospital Pharmacy in Canada 2009/2010 Report*, Bussières noted that the majority of clinical activities that were given a high priority score by survey respondents were ones for which there is little evidence to support their economic or clinical value.[9] This pilot simulation study identified a number of factors that influenced individual and team prioritization. It is of interest that participants ranked "perception of favourable impact of the activity or service" higher than "conclusive evidence" to support the activity or service. Perhaps it is time for pharmacy managers to examine and validate their perceptions of the value of various activities and services, if they really want to claim that pharmacy is an evidence-based profession. The 3 most important factors in this prioritization exercise were similar for individual and team rankings: "perception of favourable impact of activity or service on safe provision of health care", "perception of favourable impact of activity or service on health outcomes", and "conclusive evidence available to support decisions". However, some factors, such as "required to address audits or inspections", were ranked low by individuals (rank 12) but were ranked higher by the teams (rank 5). Conversely, "favourable departmental dynamics" was ranked high by individuals (rank 5) but low by teams (rank 14).

The correlations between individual and team rankings varied greatly, with the correlation coefficient ranging from 0.909 ($p < 0.001$) for Team E to 0.215 ($p = 0.42$) for Team D. This probably reflects the level of influence that the appointed leader for each team had on the ranking. A negative relationship was found for team F (correlation coefficient of –0.521, $p = 0.039$), which points to a strong leader with a very different ranking than the individual rankings of his team members.

This simulation exercise had several limitations. Participants were given a limited period of time (30 minutes) to make their decisions, and the simulation was conducted in the evening, after dinner. Limited instructions were given about the nature of the simulated hospital, its programs of care, and its workload volumes. Participants were asked to rank all 16 specified factors, although some respondents indicated verbally that they considered some of the factors to have had no influence on their prioritization decisions. The selection of pharmaceutical activities and the breakdown of coverage were informed by the research team's knowledge of hospital pharmacy practice, but these choices were nonetheless somewhat arbitrary and undoubtedly open to debate. The extent of coverage within a domain was not calculated. While the results of this simulation exercise describe the priorities of a specific group of pharmacy leaders in Canada, no demographic data were captured to describe the sample of pharmacy leaders who participated; as such, generalization to all Canadian pharmacy leaders is not possible.

CONCLUSIONS

This study demonstrated use of a simulation exercise to examine how hospital pharmacy managers make prioritization decisions. The results of this simulation support the observation that pharmacy leaders do not agree on a core set of pharmaceutical activities that should have priority. Most of the 8 teams involved in the simulation opted to provide a wide range of services, but at a low level of comprehensiveness.

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