

Hospital pharmacy staff attitudes towards automated dispensing before and after implementation

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- **OBJECTIVES** - To examine the attitude of pharmacy staff before and after implementation of automated dispensing ("the robot")
- **DESIGN** - Survey of the attitudes of pharmacy staff towards automated dispensing using a semi-structured questionnaire. Interviews with a sample of pharmacy staff
- **SUBJECTS AND SETTING** - Pharmacy staff at the Whittington Hospital, London
- **OUTCOME MEASURES** - Attitudinal scores from survey questions. Comments from questionnaires and interviews
- **RESULTS** - Overall attitudinal scores for all areas surveyed were similar or improved after the robot was implemented. There were no improvements in scores measuring job satisfaction. Most staff concern focused in management issues, particularly communication and information before automated dispensing was implemented. Scores for pharmacists and technicians were similar
- **CONCLUSION** - Involvement of pharmacy staff from the early stages of the implementation of new technology is essential. Strategies to deal with system "down-time" need to be put in place. Although automation will help to reduce risks it will not prevent all errors

In its "A spoonful of sugar" report into medicines management in NHS hospitals, the Audit Commission recommends that managers invest in automated dispensing technology.¹ Taking away the routine task of dispensing should reduce the time pharmacists and technicians spend on supply matters, allowing them instead to focus on clinical care. The report claims that redesigning the roles of pharmacy staff will enrich their work and might help with staff retention.

However, little work has been carried out to examine staff attitudes to automated dispensing and those studies that have been done have produced differing results. For example, a survey of US hospital pharmacy staff before a system was implemented found that respondents were generally positive about the use of robots.² Another study found that after installation of an automated dispensing system in a UK community pharmacy, the dispensing process became more labour-intensive and slower for all staff.³

A tandem ROWA speedcase automated picking machine (the "robot") was installed in the inpatient dispensary at the Whittington Hospital in April 2003. This study examines the attitudes of pharmacy staff before the robot was installed and six months after it was operational.

METHOD

A questionnaire was developed based on previous work carried out in the US.² This was piloted on five members of staff resulting in minor changes to wording. The final questionnaire had 37 questions and was split into four sections (see sections A to D below). Most of the questionnaire was made up of fixed questions with dichotomised, multiple choice or scaled pre-coded responses. Where a question measured attitude (in sections A and B), a five-point Likert scale was used. The questions asked are set out in Table 1 (p249 and 250).

There was a possibility that such closed questions would miss some unanticipated concerns or perspectives. Space was therefore provided at the end of the questionnaire for free text responses.

Section A Section A comprised 14 questions measuring all staff's attitudes in two areas: management issues and general robotic orientation.

Section B Section B comprised nine questions which measured dispensary-based staff's attitudes in two areas: job satisfaction and work environment. Between section A and B there was a filter question to exclude non dispensary-based staff.

Section C Section C comprised five semantic-differential scales to measure attitudes about robotic dispensing. Each item had a five-point scale which was bipolar with each extreme defined by an adjective against which the respondent was asked to rate an attribute of the robot (eg, from "fast" to "slow", with three points in between).

Section D Section D captured general demographic details. A final open question was included to give respondents the opportunity to express views not captured by previous questions.

A covering letter was included to encourage respondents to complete and return the survey. All attitudinal questions were pre-coded before data analysis, with negatively worded questions reverse-coded. The scores for these attitudinal questions ranged from 1 to 5, with 1 indicating a very positive attitude and 5 and very negative one.

Questionnaires were distributed to all pharmacy staff attending a briefing meeting held one-month before robotic dispensing was implemented (to be handed back at the end of the meeting). A second, identical questionnaire was distributed to all pharmacy staff six months after the robot became operational. A total of 97 questionnaires were distributed — 53 before implementation and 44 afterwards.

In order to gain a more detailed insight, the questionnaires were supplemented by interviews with 11 staff members — five pharmacists, five technicians and one store-keeper (responsible for filling the robot). The interview questions drew upon a preliminary analysis of the results of the two questionnaires.

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Statistics The data appeared to be normally distributed. Some staff who completed the “before” questionnaire were different from those who completed the “after” questionnaire and so unpaired t-tests were used to test for significance (between the pre- and post-implementation scores for all staff across each category as a whole and between the scores of pharmacists and technicians pre- and post-implementation across each category as a whole).

RESULTS

There were 52 responses to the first survey and 40 responses to the second, representing an overall response rate of 95 per cent. Of the total questionnaires, 48 per cent were returned by pharmacists, 41 per cent by technicians and 9 per cent by other pharmacy support staff. Two respondents did not state their occupation. Both “before” and “after” surveys were completed by 26 staff members.

Sections A to C Responses to the attitudinal questions are set out in Tables 1 and 2 (below and pp250–1). Scores for management issues and perceptions about the attributes of the robot were significantly more positive (ie, lower) after implementation, but those for orientation, environment and job satisfaction were unchanged. Comparative scores for pharmacists and technicians are included in Table 1 (below and p250). The score for orientation was significantly more positive for pharmacists than technicians. Although the score for perceptions about the attributes of the robot was significantly more positive for pharmacists before implementation, this was not true afterwards.

Section D Comments in response to the open question included at the end of the questionnaire were provided by 19 pharmacy staff (nine pre-implementation and 10 post-implementation). These responses generated

49 individual statements, which were then categorised into themes (see Table 2, p251).

Most concern focused on management issues, with respondents suggesting that a lack of involvement with implementation and a lack of information about the robot could cause problems. For example, comments included: “I have not seen a robot before and do not know its functions, and most other people haven’t [seen one before] either.”

Another key theme was concern about robot breakdown. For example: “I do have concerns about Saturdays and bank holidays regarding what to do if [the] robot malfunctions. What if no member of staff on the team (ie, me!) is able to deal with this?”

Interviews Most of the members of staff interviewed felt that the general staff meeting was an appropriate method of informing staff. However, most interviewees suggested ways that could have been used to improve communication before the robot was implemented. Some of these ideas are set out in Panel 1. The perceived advantages and disadvantages of the robot expressed by interviewees are shown in Panel 2 (p251). The advantage cited by most interviewees was increase in dispensing speed and most concern centred on whether the robot would breakdown and what to do if this happens. Views on the contribution of the robot to safety were mixed. Although most agreed that the robot eliminated picking errors, respondents thought errors could be introduced by other routes. For example, comments included: “People do not self-check. With the robot they can still make mistakes.”

Pharmacy staff interviewed generally thought that the robot made their jobs easier, especially in terms of finding stock. Comments included: “[The] dispensary is quieter . . . [and is] not so manic . . . [with people] sitting at stations . . . [and you] don’t hear [the] telephone [ringing] so much”. One staff member expressed concern that

Panel 1: Ways to improve communication with staff

- Organise site visits for a broad section of pharmacy staff
- Circulate minutes from local meetings
- Show staff a video of the robot to help them picture it
- Hold the staff meeting earlier on in the procurement process
- Publish information about the robot in a hospital newsletter or in the local press
- Obtain further feedback from staff after the general meeting
- Display the plans showing the new dispensary layout and the position of the robot
- Make more announcements about the robot at weekly staff meetings
- Put together a “robot newsletter”

embracing this technology can to some extent move us away from patient-centred care: “[It has the] potential to turn dispensing into a completely mechanical process and to some degree factors out consideration of individual patient needs (eg, oversupplying or supplying large numbers of multiple packs which potentially confuse patients). It promotes a conveyor belt approach to drug supply which does not necessarily fulfil everyone’s needs.”

DISCUSSION

The implementation of new technology presents major challenges, and these are more often behavioural than technological. Acceptance by end users of a new piece of technology is essential and the importance of this often underestimated.

Table 1: Staff responses to the attitudinal questions before and after implementing robotic dispensing

Section	Question and category	Mean score (SD) before implementation	Mean score (SD) after implementation
A	Management issues (n=52; n=40)		
	● I feel that I have been well informed about the robot	3.6(1.27)	2.6(1.14)
	● Management is concerned about the welfare of staff who will be affected by the robot	3.2(0.93)	3.0(0.77)
	● Management’s goal is to improve efficiency but they are not concerned about how the robot will affect staff	3.3(1.03)	2.8(0.92)
	● I have been involved in getting the department ready for the robot	3.6(1.41)	3.3(1.30)
	Mean (SD) score of all staff for management issues category (n=52; n=40)	3.4(1.19)	2.9(1.08)*
	Mean (SD) score of pharmacists for management issues category (n=25; n=19)	3.2(1.27)	2.7(1.18)
	Mean (SD) score of technicians for management concern category (n=23; n=15)	3.6(1.13)	3.2(1.05)

Table 1: Staff responses to the attitudinal questions before and after implementing robotic dispensing (continued)

Section	Question and category	Mean score (SD) before implementation	Mean score (SD) after implementation
A	Orientation (n=52; n=40)		
	● The robot will make fewer dispensing errors than humans	2.6(1.08)	1.7(0.61)
	● The robot will make my job easier	2.8(0.91)	2.0(1.07)
	● I expect the robot will break down frequently	3.0(0.89)	2.9(0.96)
	● I am looking forward to/I like working with the robot	2.3(0.91)	1.8(0.93)
	● The robot will allow us to dispense prescriptions more quickly	2.5(0.97)	1.8(0.93)
	● I am anxious about working with the robot	2.7(1.15)	1.8(0.90)
	● I am not afraid of losing my job to the robot	2.2(1.12)	2.5(1.47)
	● Increased use of robots mean that there will be fewer jobs available in the future	3.0(1.16)	2.5(1.16)
	● The robot seriously threatens my future	2.3(1.10)	1.9(0.82)
	● Because more hospitals are installing robots, my chances of finding another job are small	2.5(1.17)	2.0(1.01)
	Mean (SD) score of all staff for orientation category (n=52; n=40)	2.57(1.08)	2.1(1.08)
	Mean (SD) score of pharmacists for orientation category (n=25; n=19)	2.20(0.94)	1.9(0.95)
	Mean (SD) score of technicians for orientation category (n=23; n=15)	2.91(1.07)†	2.4(1.19)†
B	Job satisfaction (n=28; n=15)		
	● I feel that I am often under too much pressure at work	3.3(1.03)	3.7(0.84)
	● I have enough time to do my job well	2.7(0.99)	3.1(1.11)
	● Most mornings I dread going in to work	2.7(1.36)	2.7(1.40)
	● I feel that my skills are being fully used	3.4(1.03)	3.1(1.18)
	● At the end of most days I feel I have done a good job	2.2(0.96)	2.7(0.90)
	● Usually, I don't mind going to work	2.0(0.74)	2.4(1.03)
	● I feel that the job I do directly affects patient care	1.9(0.68)	1.7(0.46)
	Mean (SD) score of all staff for job satisfaction category (n=28; n=15)	2.6(1.14)	2.8(1.17)
	Mean (SD) score of pharmacists for job satisfaction category (n=12; n=6)	2.6(1.08)	2.7(1.08)
	Mean (SD) score of technicians for job satisfaction category (n=15; n=9)	2.6(1.15)	2.9(1.14)
B	Environmental (n=28; n=15)		
	● The dispensary feels busy most of the time	3.6(1.03)	4.0(1.03)
	● I feel that the volume of dispensing I am asked to do is just about right	2.6(1.13)	2.8(0.98)
	Mean (SD) score of all staff for environmental category (n=28; n=15)	3.1(1.19)	3.4(1.17)
	Mean (SD) score of pharmacists for environmental category (n=12; n=6)	3.0(1.21)	3.3(0.94)
	Mean (SD) score of technicians for environmental category (n=15; n=9)	3.2(1.19)	3.4(1.21)
C	Attribute rating (n=52; n=40)		
	● Useful/useless	2.2(0.82)	1.7(0.87)
	● Fast/slow	2.3(0.90)	1.9(0.89)
	● Accurate/inaccurate	2.3(0.82)	1.6(0.63)
	● Threatening/non-threatening	2.3(0.92)	1.9(1.14)
	● Safe/unsafe	2.5(0.83)	1.8(0.89)
	Mean (SD) score of all staff for attribute rating category (n=52; n=40)	2.3(0.86)	1.8(0.91)†
	Mean (SD) score of pharmacists for attribute rating category (n=25; n=19)	2.0(0.64)	1.6(0.68)
	Mean (SD) score of technicians for attribute rating category (n=23; n=15)	2.5(0.97)†	2.0(1.13)

“SD” means standard deviation. The lower the mean score, the more positive the response to the aspect of automated dispensing under consideration. The first “n” number indicated in a set of brackets indicates the number of relevant respondents before implementation and the second

“n” number indicates the number of relevant respondents after implementation. “*” indicates that differences between the relevant groups are significant to 95 per cent confidence limits ($P \leq 0.05$) and “†” indicates that differences are significant to 99 per cent confidence limits ($P \leq 0.01$)

Table 2: Themed responses to the open question in Section D

	<i>Number of times theme mentioned in responses (n=49)</i>
Positive themes	
● Staff will be able to be redeployed elsewhere to the benefit of other services	3
● Robot reduces errors	2
● Robot is fast	4
● General positive perceptions	2
Negative themes	
● Money spent on the robot should have been used elsewhere	3
● Technical problems and functionality	4
● The slowness of robot	4
● Concerns about breakdown	5
● The robot does not reduce errors	2
● The robot does not reduce stock levels	3
● General negative perceptions	2
General	
● Staff should be fully involved and involved	6
● Error rate is dependent on operator	2
● Training needs	2
● Can the robot be accessed remotely?	2
● Miscellaneous others	3

Involvement of pharmacy staff is essential for the successful implementation of automatic dispensing. The poorest attitude scores related to perceptions of management's motives for purchasing the system. These attitude scores improved once the robot was operational. This finding highlights the need for close involvement of a greater cross-section of pharmacy staff to relieve anxiety and reduce hearsay. Reluctance to face change is common, and involving staff may help curb this. Involvement can be provided by, for example, consulting staff from the beginning, ensuring that they know their interests are being taken into account in the design and selection of the new system, and by providing them with frequent feedback.

Although an increase in job satisfaction with improved staff retention has been perceived as an advantage of automated dispensing, the survey results presented here indicated that there was no significant difference among staff after the system was implemented. As mentioned above, however, most pharmacy staff interviewed post-implementation thought that the robot made aspects of their jobs easier.

Although technicians initially had poorer perceptions of the attributes of the robot, there was no difference with pharmacists after robotic dispensing was implemented. This might be explained by the fact that pharmacists generally have an increased awareness of the advantages of robotic dispensing through information in the pharmaceutical press, to which not all technicians would have access. Once technicians started using the robot, the attributes of

automated dispensing became clearer. This finding reinforces the need to involve and inform staff from the outset.

The results also highlighted that is important to have a strategy to deal with system "down-time". For example, users should be trained and know how to respond to system failures. Policies and procedures should be drawn up defining the most common types of failure and action needed to resolve them. At the Whittington Hospital, a troubleshooting guide has also been developed.

Automated dispensing is a major cultural change within pharmacy. As with other new technologies, such as electronic prescribing,

robots have the potential to improve the quality of patient care by, for example, reducing risks. However, they can also introduce new risks — in particular, there is a perceived risk that pharmacy staff might be tempted to slacken their vigilance and depend too much on the technology to control errors. It is important therefore not to "sell" the system as being error-free and thereby avoid unrealistic expectations. Care must also be taken to ensure new systems are safe and are monitored to uncover any new risks.

CONCLUSION

Most staff at the Whittington Hospital felt more positive about automated dispensing after the system had been implemented. Their biggest concern was that they did not generally feel that they were fully involved early enough in the procurement process. Greater staff involvement would most likely have helped improve the attitudinal scores. It is also important to have strategies in place to deal with "down-time" and to recognise that automated dispensing is not error-free, since these issues are also of particular concern to staff.

REFERENCES

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Panel 2: Some perceived advantages and disadvantages of robotic dispensing expressed by interviewees

Advantages

- Increases dispensing speed
- Greater efficiency
- Improves safety
- Improves stock control
- Increases storage capacity
- Improves other hospital staff members' perception of pharmacy
- Improves security
- Releases staff to perform more clinical duties

Disadvantages

- Risk of breakdown
- Staff training issues
- Disruption to work
- Reduces job security
- Noise during operation
- Discourages staff from checking stock accurately
- Problems when on-call
- Dealing with recalls
- Inaccurate stock levels
- Staff technophobia
- Time needed to load
- Wastage
- Insufficient storage capacity