IJPP
International Journal of
Pharmacy Practice

IJPP 2008, 16: 47–53

Received December 22, 2006
Accepted September 4, 2007
DOI 10.1211/ijpp.16.1.0009
ISSN 0961-7671

An evaluation of two automated dispensing machines in UK hospital pharmacy

Bryony Dean Franklin, Kara O'Grady, Luka Voncina, Janice Popoola and Ann Jacklin

Abstract

Objective To assess the impact of two different automated dispensing machines ('robots') on safety, efficiency and staff satisfaction, in a UK hospital setting.
Setting An NHS teaching hospital trust with two main sites each comprising 450 beds. A Swisslog Pack Picker automated dispensing machine was installed in the dispensary at site 1 in December 2003, and a Rowa Speedcase at site 2 in October 2005.
Method A before-and-after study design was used on each site, with site 2 acting as a control for site 1. Staff recorded data on dispensing errors identified at the final-check stage; an observer recorded the time taken to label, pick and assemble dispensed items; we recorded turnaround times for the different types of prescription and assessed storage space efficiency. We also used questionnaires to explore staff views.
Key findings The robot resulted in a significant decrease in dispensing errors on each site (from 2.7 to 1.0% of dispensed items on site 1, and from 1.2 to 0.6% on site 2). Reductions occurred in errors involving wrong content; there was no clear effect on labelling errors. There were reductions in the time required to pick items for dispensing; there was no impact on labelling or assembly times. There was no conclusive effect on turnaround times. Increases in storage capacity occurred on each site; staff on site 2 were more satisfied following introduction of the robot; there was no difference on site 1.
Conclusion Installation of a dispensary robot has modest benefits in terms of reduced dispensing errors, reduced picking times, increased staff satisfaction and increased storage capacity; there was no conclusive impact on turnaround times. These findings seem to be independent of the type of robot installed.

Centre for Medication Safety and Service Quality, Imperial Healthcare NHS Trust, London, UK

Bryony Dean Franklin, director
Kara O'Grady, research pharmacist
Luca Voncina, pharmacy student

Imperial Healthcare NHS Trust, London, UK

Ann Jacklin, chief pharmacist

Department of Practice and Policy, The School of Pharmacy, University of London, UK

Bryony Dean Franklin, visiting professor
Ann Jacklin, visiting professor
Janice Popoola, MSc student

Correspondence: Professor Bryony Dean Franklin, Pharmacy Department, Hammersmith Hospital, London W12 0HS, UK. E-mail: bryony.deanfranklin@imperial.nhs.uk

Acknowledgements: Dispensary staff on each site, for assistance with data collection; Bo Ye, for assistance with data entry and analysis; Shubal Islam, for assistance with collection of data on dispensing times.

Introduction

Pharmacy-based automated dispensing machines, for the automated selection of original packs, are widely advocated,[1] and becoming common in UK hospital pharmacies. The theoretical benefits of automation include supporting increased activity, making better use of existing staff skills, decreasing dispensing errors, reducing dispensing times, improving storage capacity, improving stock control, and keeping pace with change.

However, few studies have been published to support or refute these theoretical benefits. Of the small number of UK studies that have been conducted, some are published only in abstract form,[2–4] and others focus only on staff views.[5,6] Two papers present more comprehensive evaluations,[7,8] but give little detail of the methods used. There have been no comparative studies of more than one automated dispensing system.

Over the last 3 years, two different automated dispensing machines ('robots') have been installed within our trust, one in each main dispensary. We therefore wanted to evaluate the impact of each of these on safety, efficiency, and staff satisfaction.

Our objectives were to assess the impact of each dispensing robot on the following:

1 the frequency and types of dispensing errors identified at the 'final-check' stage
2 time taken to dispense inpatient, outpatient and discharge prescriptions
3 turnaround times for inpatient, outpatient and discharge prescriptions

4 drug storage space
5 dispensary staff opinions and satisfaction.

Methods

Setting

The study took place in a large teaching trust, with 950 beds across three hospitals. At the time of this study, the two main sites each comprised about 450 beds; a full range of pharmacy services was provided from each of these sites. Dispensing procedures were typical of those in UK hospitals. Prescriptions were dispensed for outpatients and patients being discharged from hospital, as well as medication being supplied for inpatients. The majority of medication was dispensed in manufacturers' original packs; some was dispensed in smaller quantities. Medication was usually dispensed by dispensing assistants, preregistration pharmacists or qualified pharmacy technicians, and then checked by a pharmacist or accredited checking technician. Procedures and staff training were the same on the two sites throughout the study period; junior staff generally rotated between sites while more senior staff were based on one site. A dispensing robot was put into the dispensary at each of these sites.

At site 1, the intervention was a Pack Picker automated dispensing machine (version 4.0; Swisslog, Switzerland). Two units were installed in December 2003 and a multi-load device in August 2004. A third unit was installed in Spring 2005 during the collection of post-intervention data. Post-intervention data on dispensing errors, dispensing times and storage efficiency were collected with two units in operation; data on turnaround times and staff views were collected with three units. Robot workload figures suggest that, at the time of data collection, the robot dispensed about 2500 packs each week for ward stock or individual patients.

At site 2, the intervention was a Speedcase (version 2.6.9.6, ARX Ltd, UK) automated dispensing machine. At the time of data collection, about 3700 items were dispensed each week by the robot for inpatients or ward stock.

The study was approved by Riverside Research Ethics Committee.

Study design

The study design is summarised in Figure 1. The main confounding factor about which we were concerned was the experience of the staff working within the dispensary. This generally follows an annual cycle, with the majority of new staff starting in late summer and autumn. Staff experience might be expected to affect dispensing errors, turnaround times and time taken to dispense. The timing of the study meant that pre-intervention data were collected at site 1 in late summer and autumn 2003 when there were many newly qualified staff in post, and post-intervention data in spring and early summer 2005 when staff were more experienced. Data were therefore collected at similar times at site 2, before a robot was installed, to act as a control. Both pre- and post-intervention data were collected during spring on site 2, which could therefore act as its own control.

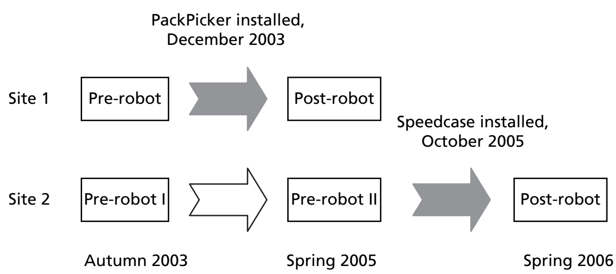

Figure 1 Study design.

Dispensing errors

We studied dispensing errors identified at the final-check stage within the pharmacy department. The methods, definitions and classifications used were the same as those used previously.[9] Following a series of briefing sessions about the study's objectives and how to record the data, pharmacists, accredited checking technicians and staff undergoing checking accreditation were asked to record details of all dispensing errors identified at the final-check stage, for 2 weeks within each data-collection period. Weekends and evenings were included.

To obtain a denominator with which to calculate the error rate, the numbers of items dispensed during each 2-week period were obtained using the pharmacy computer system. Based on previous work,[9] we expected a 2.1% rate of dispensing errors identified at the final-check stage. Using the pharmacy computer system, we estimated that 750 items were dispensed for individual patients each weekday on each site; a two-week data collection period would therefore give us a sufficient sample size to identify a change in dispensing error rate from 2.1% to 1.2%, or from 2.1% to 3.2%.

Time taken to dispense

These data were collected during 5 days' observation during each study period. The time taken was classified into that required to produce all the labels for each inpatient, outpatient or discharge prescription (labelling time), and the time spent dispensing those items (dispensing time). The dispensing time was further subdivided into picking the items from the dispensary shelves (or robot) and assembly of all items ready for checking. The time taken to check dispensed items was not studied.

Data collection took place all day; the researcher alternated between hourly periods of observing labelling at each of the three computer terminals in turn, and hourly periods of observing dispensing. Times were recorded to the nearest second using a digital wristwatch. The number of items on the relevant prescription or medication order was recorded so that the time per item could be calculated. Relabelling or correcting mistakes made during the original labelling of a prescription were included in the labelling time; time spent dealing with interruptions was excluded.

Turnaround times

At the time of the study, all outpatient prescriptions were routinely time-stamped in and out on each site. Discharge prescriptions were recorded in and out in a register. Inpatient transcription sheets were routinely time-stamped in but not out. For the duration of the study, dispensary staff were therefore asked to time-stamp inpatient transcription sheets upon completion. Turnaround times were collected retrospectively for 4 weeks, excluding weekends, during each data-collection period. In view of the large numbers of outpatient prescriptions received, a one in two sample was selected by including only those relating to patients with a hospital number ending in an even digit. We excluded from analysis a small number of discharge prescriptions that were not required the same day.

Drug storage space

The number of items stored per square metre of floor space was estimated during each data-collection period. Pre-intervention this involved counting the number of full and part packs on shelves housing items that were to be stored in the robot. The floor area occupied by these shelving units was measured, including allowance for a one-metre walk-space on the accessible picking side(s) of the shelving. Post-intervention, the number of packs in the robot was reported and the floor area measured, again allowing for a one-metre walk space on the sides to which access was required.

Views of dispensary staff

A questionnaire assessing staff satisfaction and attitudes was developed, based on Likert scales and addressing issues raised in a previous study,[6] and others perceived to be relevant. This asked respondents to indicate their overall level of satisfaction with the system in place at the time, and included other items addressing perceptions of the department's ability to keep pace with change, use of staff skills, common problems encountered and the robot's perceived impact (Appendix). During each data-collection period, staff of all grades who worked regularly in the relevant dispensary (19 on site 1, and 21 on site 2) were asked to complete the questionnaire, which took about 15 minutes. Questionnaires were completed anonymously, distributed via staff mailboxes, and included instructions and an explanation about the study.

Data analysis

For site 1, pre-intervention data and post-intervention data were compared, with the two sets of pre-intervention data from site 2 acting as a control. For site 2, the second set of pre-intervention data was compared with the post-intervention data. In each case, the most appropriate statistical test was selected based on the type of data and its distribution. Percentage dispensing error rates were compared using the 95% confidence interval (CI) for the difference between two proportions. Dispensing times, turnaround times and staff attitudinal scores were compared using Mann–Whitney tests. Microsoft Excel was used throughout.

Results

Dispensing errors

Table 1 summarises the results; numbers of items dispensed each week were similar to those dispensed each week throughout the year. At site 1, the overall reduction in dispensing errors from 2.7% to 1.0% following robot installation was statistically significant (CI –1.3% to –2.1%); the small reduction from 1.4% to 1.2% at the control site (site 2) was not (CI –0.5% to 0.1%). At site 2, following introduction of the robot, there was a significant reduction from 1.2% to 0.6% (CI –0.3% to –0.9%). Reductions in dispensing errors occurred for all types of dispensed item.

The types of error are summarised in Table 2. On each site, statistically significant reductions occurred in content errors following introduction of the robot (CIs –0.9% to –0.5%, and –0.6% to –0.2% on sites 1 and 2 respectively). There was a significant reduction in labelling errors following the introduction of robot on site 1 (CI –0.6% to –1.2%) and a

Table 1 Numbers of dispensing errors identified at the final-check stage in each 2-week study period, presented according to type of prescription or medication order

Period	Items dispensed	Errors identified, n (% of items dispensed)			
		IP	OP	TTA	Total
Site 1					
Pre (Autumn 2003)	9161	35 (1.2%)	134 (4.1)	76 (2.6)	245 (2.7)
Post (Spring 2005)	9289	26 (0.8)	20 (0.6)	47 (1.8)	93 (1.0)[a]
Site 2					
Pre I (Autumn 2003)	8250	50 (1.5)	27 (0.9)	41 (2.1)	118 (1.4)
Pre II (Spring 2005)	8033	41 (1.6)	44 (1.2)	14 (0.7)	99 (1.2)
Post (Spring 2006)	7894	22 (0.9)	17 (0.5)	7 (0.3)	46 (0.6)[b]

IP, inpatient; OP, outpatient; TTA, to take away (discharge).
[a]Reduction from pre to post was statistically significant (95% CI for the difference –1.3% to 2.1%).
[b]Reduction from pre II to post was statistically significant (95% CI for the difference –0.3% to –0.9%).

Table 2 Dispensing errors identified at the final-check stage, presented according to type of error

Period	Errors identified, n (% of items dispensed)			
	Content	Labelling	Documentation	Total
Site 1				
Pre (Autumn 2003)	96 (1.1)	140 (1.5)	9 (0.1)	245 (2.7)
Post (Spring 2005)	34 (0.4)	58 (0.6)	1 (0.01)	93 (1.0)
Site 2				
Pre I (Autumn 2003)	47 (0.6)	70 (0.9)	1 (0.01)	118 (1.4)
Pre II (Spring 2005)	52 (0.7)	47 (0.6)	1 (0.01)	99 (1.2)
Post (Spring 2006)	18 (0.2)	32 (0.4)	1 (0.01)	51 (0.6)

smaller reduction on the control site which did not reach statistical significance (CI –0.6% to 0%). The small reduction in labelling errors following the introduction of the robot on site 2 did not reach statistical significance (CI –0.4% to 0%).

Time taken to dispense inpatient, outpatient and discharge prescriptions

Table 3 summarises the impact of the robot on the time taken to label, pick and assemble items. Significant reductions occurred in picking times on each site following the introduction of the robot; median picking times reduced from 49 s to 32 s on site 1 ($P = 0.001$; Mann–Whitney test), and from 19 s to 0 s on site 2 ($P < 0.001$). A median picking time of 0 s was recorded on site 2 since in many cases all items had arrived from the robot before all the labels had been printed. There were no changes in median picking time during the control period on site 2, or in labelling or assembly times at any time.

Turnaround times for inpatient, outpatient and discharge prescriptions

Results are summarised in Table 4. In some cases, timing data had been recorded for less than half of the items assessed, and so statistical analysis was not considered appropriate. There was no change in turnaround times for discharge prescriptions at site 1; no statistical analysis could be conducted for inpatient or outpatient prescriptions on this site. However, there was a significant reduction in turnaround times for all types of prescription at site 2 during the control period. Following the introduction of the robot on site 2, there was a significant increase in turnaround times for discharge prescriptions, and no effect for outpatients. Statistical analysis could not be conducted for inpatient transcription sheets as so few had complete timing data.

Drug storage space

Pre-intervention data are shown in Table 5. At site 1, post-intervention, the robot consisted of two units each of 126 cm width and 222 cm length. These together formed a footprint of 252 cm by 222 cm (5.59 m^2). Unit one contained 2910 packs and unit two 3296 packs at the time of data collection, corresponding to 1108 items/m^2 without allowing for any walk space, or 766 items per m^2 allowing a 1 m access space along the longest side of the robot. This represents a 23% increase in storage capacity.

At site 2, post-intervention, the robot formed a footprint of 9.02 m^2 and held about 8500 packs. This corresponds to 942 items/m^2 without allowing for any walk space, or 823 items/m^2 allowing a 1 m access space along the shortest side of the robot. This represents a 123% increase in storage capacity.

Views of dispensary staff

At site 1, 11 questionnaires were returned in each phase of the study, representing response rates of 58% pre- and 52% post-intervention. At site 2, 12 questionnaires (57%) were

Table 3 Labelling, picking and assembly times

Period	Median times (minutes:seconds), expressed per item					
	Labelling		Picking		Assembly	
Site 1						
Pre (Autumn 2003)	00:44 (n = 110)	$P^a = 0.12$	00:49 (n = 88)	$P = 0.001$	00:42 (n = 88)	$P = 0.24$
Post (Spring 2005)	00:47 (n = 183)		00:32 (n = 75)		00:45 (n = 85)	
Site 2						
Pre I (Autumn 2003)	00:43 (n = 126)	$P = 0.17$	00:21 (n = 62)	$P = 0.53$	00:40 (n = 62)	$P = 0.53$
Pre II (Spring 2005)	00:43 (n = 172)		00:19 (n = 102)		00:41 (n = 122)	
Post (Spring 2006)	00:47 (n = 153)	$P = 0.18$	00:00 (n = 93)	$P < 0.001$	00:53 (n = 93)	$P = 0.9$

[a] P values relate to Mann–Whitney tests.

Table 4 Turnaround times

	Number assessed	Number with timing data complete and legible (%)	Median turnaround time	Interquartile range	*P* value (Mann–Whitney)
Site 1					
Discharge prescriptions					
Pre	1057	959 (91)	1 hr 30 min	49 min to 2 h 28 min	NS[a]
Post	1008	841 (83)	1 hr 30 min	55 min to 2 h 25 min	
Inpatient transcription sheets					
Pre	1191	739 (62)	1 hr 18 min	28 min–2 h 51 min	Not assessed[b]
Post	1415	492 (35)	1 hr 51 min	48 min–3 h 2 min	
Outpatient prescriptions					
Pre	1542	723 (47)	24 min	17 min to 32 min	Not assessed
Post	1196	649 (54)	29 min	20 min to 41 min	
Site 2					
Discharge prescriptions					
Pre I	677	355 (52)	1 hr 36 min	37 min to 1 h 44 min	<0.001
Pre II	695	616 (89)	54 min	30 min to 1 h 27 min	
Post	846	704 (83)	1 hr 18 min	50 min to 1 h 55 min	<0.001
Inpatient transcription sheets					
Pre I	1109	815 (73)	1 hr 19 min	38 min to 2 h 44 min	<0.001
Pre II	1126	842 (75)	1 hr 9 min	32 min to 1 h 54 min	
Post	1612	261 (16)	48 min	21 min to 1 h 34 min	Not assessed
Outpatient prescriptions					
Pre I	1135	899 (79)	22 min	14 min to 30 min	0.001
Pre II	1359	1051 (77)	19 min	13 min to 27 min	
Post	1328	1000 (75)	18 min	11 min to 26 min	NS

[a]NS, not significant.
[b]Not assessed: indicates where data were available for less than 50% of the number of prescriptions assessed.

Table 5 Pre-intervention numbers of packs (full and part packs) per square metre of floor area

Type of product	Total packs per m^2 of floor area
Site 1	
Inhalers	381
Eye drops	947
Creams/ ointments	758
Tablets	412
Mean	625
Site 2	
Tablets and oral liquids	410
Externals	327
Mean	369

completed and returned pre-intervention, and 21 (95%) post-intervention.

When respondents were asked to rate their overall level of satisfaction with the system of dispensing both pre- and post-intervention, there was no difference in median scores on site 1; the median score in each case was 1, indicating 'satisfied'. At site 2, most were indifferent (median score = 0) pre-intervention, and very satisfied (median score = 2) post-intervention ($P = 0.002$; Mann–Whitney test).

At site 1, there were significant differences pre- and post-intervention for responses to two further items. These were 'there is too little space available now for dispensing and checking', which staff agreed with pre-intervention and disagreed with post-intervention ($P = 0.001$; Mann–Whitney test); and 'computer failures rarely happen at the moment', which staff agreed with pre-intervention and disagreed with post-intervention ($P = 0.006$). On site 2, responses to three statements differed significantly pre- and post-intervention. These were: 'the robot will free up/frees up more time for performing other duties such as patient counselling', which staff agreed with more strongly pre-intervention ($P = 0.025$); 'I am happy overall with the current dispensing system', which staff were indifferent to pre-intervention and agreed with post-intervention ($P = 0.001$); and 'it takes too long to pick the items needed for prescriptions with the current system', which staff were indifferent to pre-intervention and disagreed with post-intervention ($P = 0.006$).

Discussion

Main findings

Our data suggest that both dispensing robots decreased dispensing errors, decreased picking times, and increased storage capacity. There was an increase in staff satisfaction on one of the two sites. The effect on prescription turnaround times was inconclusive, mainly due to difficulties in collecting these data. The impact on dispensing errors was largely due to a reduction in content errors; there was also a reduction in labelling errors on site 1, but data collected at the control site suggest that this may have been due to increased staff experience.

The results were similar on the two sites, suggesting that such findings should be generalisable to different robots. There was a greater increase in storage capacity on site 2; this was due to more efficient pre-intervention storage on site 1, and different requirements for walk-space access to the two robots. It is of interest that there was no clear increase in staff satisfaction on site 1; this may be due to the questionnaire being administered relatively soon after installation while some early operational issues were still being resolved.

Strengths and limitations

The strengths of this study are that we collected data on a range of outcome measures using robust methods, and that these same methods were used to evaluate two different robots within the same organisation. The study is therefore more comprehensive than those published previously and provides a more detailed understanding of the impact of automated dispensing machines. We also controlled for the main confounding factor of concern, namely differences in staff experience at different times of the year.

There are limitations associated with some aspects of data collection. We studied dispensing errors identified at the final-check stage rather than employing observers to check items that had already been final checked, and we did not assess the clinical significance of the errors identified. We encountered practical problems with collecting comprehensive data on turnaround times. We collected data on dispensing times over only one week during each study period, and we did not correct for multiple comparisons when analysing responses to Likert scales within the staff questionnaire. In addition, although response rates were relatively high, we do not know whether the opinions of the non-responders differed. We did not compare the time taken to load the robot versus to put stock away on the dispensary shelves; future studies should also include this as an outcome measure. Finally, a third unit was introduced on site 1 during the collection of post-intervention data; it is not known whether this will have affected the results obtained.

Comparison with previous work

There have been few studies of automated dispensing in UK hospital pharmacies. Our findings are in line with those published previously, suggesting a reduction in dispensing errors,[2,7,8] and an increase in drug storage space.[8] We did not demonstrate a reduction in turnaround times as suggested elsewhere;[3,7,8] our data suggest that turnaround times may be more sensitive to other factors, as the biggest changes were identified during the control period on site 2. However previous studies generally give little detail of the methods used and it is therefore difficult to make meaningful comparisons. Only one previous study has explored staff perceptions before and after introduction of a dispensary robot;[6] the main concern was lack of information about the robot and why it was introduced. The methods were different from those used in the present study and it is difficult to compare the results obtained.

Recommendations

The findings have implications for hospital pharmacy managers planning to introduce dispensing robots. The benefits are widely believed to include decreasing dispensing errors, reducing dispensing times, improving storage capacity and increasing staff satisfaction. Our data indicate reductions in dispensing errors and picking times, and increases in storage capacity and staff satisfaction, as predicted. However, the reduction in dispensing errors was relatively modest, as was the reduction in picking times. There was no conclusive effect on turnaround times. Future studies should include assessment of the time taken to load the robot versus put stock away on the dispensary shelves, the effect on stock control, and an assessment of the clinical significance of dispensing errors, using validated methods.[10]

Conclusion

Installation of a dispensing robot had modest benefits in terms of reduced dispensing errors, reduced picking times, increased staff satisfaction and increased storage capacity; the effect on turnaround times was inconclusive. These findings seem to be independent of the type of robot installed.

References

1 A spoonful of sugar: medicines management in NHS hospitals. London: Audit Commission; 2001.
2 Whittlesea C, Phillips C, Burfield R, Roberts D, Savage J, Way C. Evaluation of ward stock distribution incidents at two Welsh hospitals pre- and post-automation. Int J Pharm Pract 2004;12:R70.
3 Whittlesea C, Phillips C, Burfield R, Roberts D, Way C. Evaluation of the outpatient dispensary service at Llandough hospital pre- and post-automation. Int J Pharm Pract 2005;13:R90.
4 Slee A, Hughes D, Marsh P. Introducing automation reduces medication errors. Abstract presented at American Society of Health-System Pharmacists Conference, New Orleans, December 2001.
5 Whittlesea C, Morgan C. Pharmacy technicians' views on automation. Hospital Pharmacy Europe 2005;March/April:17–18.
6 Coleman B. Hospital pharmacy staff attitudes towards automated dispensing before and after implementation. Hosp Pharm 2004; 1:248–51.
7 Slee A, Farrar K, Hughes D. Implementing an automated dispensing system. Pharm J 2002;268:437–38.
8 Fitzpatrick R, Cooke P, Southall C, Kauldhar K, Waters P. Evaluation of an automated dispensing system in a hospital pharmacy dispensary. Pharm J 2005;274:763–5.
9 Beso A, Franklin BD, Barber N. The frequency and potential causes of dispensing errors in a hospital pharmacy. Pharm World Sci 2004;27:182–90.
10 Dean BD, Barber ND. A validated, reliable method of scoring the severity of medication errors. Am J Health-Syst Pharm 1999;56:57–62.

Appendix: Items used as part of the staff questionnaire; respondents used a five-point Likert scale to indicate their extent of agreement with each

A The robot helps the dispensary keep pace with similar IT developments in other UK hospitals.
B Outpatient waiting times are too long with the current system.
C The robot will enhance/enhances the image of the department.
D The robot will have/has had no effect on dispensing errors.
E There are currently too many complaints from patients about waiting times.
F I use my pharmaceutical skills to their full potential in the dispensary.
G The robot will free up/frees up more time for performing other duties such as patient counselling.
H I am happy overall with the current dispensing system.
I The robot will slow down/slows down the time taken to dispense items.
J There are currently too many complaints from ward staff about waiting times.
K The build-up of work in the dispensary at peak times is stressful.
L The robot will improve/has improved staff morale.
M The work in the dispensary is completed within a reasonable time frame with the current system.
N There is too little space available now for dispensing and checking.
O It takes too long to pick the items needed for prescriptions with the current system.
P The robot will reduce/has reduced the amount of space that needs to be devoted to storage of stock.
Q The robot will increase/has increased the amount of available workspace in the dispensary.
R Computer system failures rarely happen at the moment.