Journal of Scientific and Innovative Research 2020; 9(2): 32-39
Available online at: www.jsirjournal.com

Research Article

ISSN 2320-4818
JSIR 2020; 9(2): 32-39

Received: 22-05-2020
Accepted: 14-06-2020

Mikio Murata
Department of Clinical Pharmacy, Yokohama University of Pharmacy, 601, Matano-Cho, Totsuka-Ku, Yokohama, Kanagawa 245-0066, Japan

Eri Takeishi
Department of Clinical Pharmacy, Yokohama University of Pharmacy, 601, Matano-Cho, Totsuka-Ku, Yokohama, Kanagawa 245-0066, Japan

Hiroshi Kanno
Department of Pharmacy, Saiseikai Yokohamashi Tobu Hospital, 3-6-1 Shimosueyoshi, Tsurumi Ward, Yokohama, Kanagawa 230-0012, Japan

Masahiro Sumi
Department of Clinical Pharmacy, Yokohama University of Pharmacy, 601, Matano-Cho, Totsuka-Ku, Yokohama, Kanagawa 245-0066, Japan

Correspondence:
Mikio Murata
Department of Clinical Pharmacy, Yokohama University of Pharmacy, 601, Matano-Cho, Totsuka-Ku, Yokohama, Kanagawa 245-0066, Japan
Email:
mikio.murata@hamayaku.ac.jp

Questionnaire survey concerning the recognition of GS1 DataBars by hospital pharmacists

Mikio Murata[*], *Eri Takeishi, Hiroshi Kanno, Masahiro Sumi*

Abstract

In Japan, labeling of packages of prescription drugs was changed from JAN (Japanese Article Number) codes to GS1 DataBars, and the use of GS1 DataBars in medical services is expected to aid in the prevention of medical accidents, such as drug mix-ups, and improve traceability. In Japan, prescription drugs are dispensed primarily using PTP (Press Through Package) and SP (Strip Package) sheets, and tablets and capsules are seldom given to patients in bottles as in the United States and EU countries. We carried out a questionnaire survey of hospital pharmacists who handle drugs as their job to investigate the viewpoints from which they evaluate the design of PTP sheets of drugs. When the position of the bar code was evaluated from the viewpoint of "readability", there was little difference between the top and bottom of the PTP sheet, but there was a difference between the top (over the tablets) and the margin of the PTP sheet. To the question "Which is more functional, endless printing or pitch printing?", the pitch method was selected twice as frequently. "Ergonomics of holding the drug with the left hand and holding the scanner with the right hand" were suggested to be important for rapid reading of GS1 DataBars with minimum movements during the complex dispensing operation.

Keywords: GS1 DataBar, Bar Code, Press Through Package, Strip Package, Package Designs, Ethical Drugs.

INTRODUCTION

In Japan, labeling of packages of prescription drugs was changed from JAN (Japanese Article Number) codes to GS1 DataBars [1], and the use of GS1 DataBars in medical services is expected to aid in the prevention of medical accidents, such as drug mix-ups, and improve traceability [2-6]. In addition to the conventional labeling by the sales packaging unit of prescription drugs (sales units: boxes of individual packaging) with GS1 DataBars, dispensing packaging units (minimum packaging unit for manufacturing and sales: ampules, PTP) are also recommended to be labeled [7]. Labeling of packages of drugs and medical devices with GS1 DataBars has become a legal obligation, and partial amendment of the law is pending [8]. At pharmacies and hospital pharmaceutical departments, the application of GS1 DataBars for the prevention of drug mix-ups during dispensing and inventory management of drugs is increasing. In Japan, prescription drugs are dispensed primarily using PTP (Press Through Package) and SP (Strip Package) sheets, and tablets and capsules are seldom given to patients in bottles as in the United States and EU countries. However, PTP and SP sheets of prescription drugs are not standardized, and there are no regulations concerning the size or color of PTP and SP sheets, or the color or size of the characters of information such as the drug name. For this reason, PTP and SP sheets of different sizes, shapes, and colors are in circulation. Concerning labeling with GS1 DataBars, labeling itself is necessary, but the position, number, color, and background color of bar codes on PTP and SP sheets vary widely partly because of the development of printing technology.

Thus, the diversity of bar code labeling is progressing, but there have been few reports of pharmacists' assessment of the present state of bar code printing. We carried out a questionnaire survey of hospital pharmacists who handle drugs as their job to investigate the viewpoints from which they evaluate the design of PTP sheets of drugs.

MATERIALS AND METHODS

The study protocol was reviewed and approved by the institutional review boards of the participating institutions.

We carried out a questionnaire survey of GS1 DataBars printed on PTP sheets of drugs for internal use concerning items including the printing method (endless or pitch method), printing position on the PTP sheet, presence of a box around the GS1 DataBar, printing direction (vertical when the bar code was printed perpendicularly to the drug name and horizontal when it was printed parallelly) using 14 samples.

Respondents

The questionnaire survey was administered to 35 pharmacists working at hospital pharmaceutical departments in August 2017. The questionnaire is shown in Fig. 1 and Fig. 2.

The questionnaire was prepared with attention to the following points:

Points of attention in preparing the questionnaire

1. Method for bar code printing as a design for improved readability

Which of the bar code printing designs of the 14 samples (A-N) is optimal regarding the "bar code readability"?

- If only 1 bar code is printed, which position is optimal?
- Which are more readable, boxed bar codes or non-boxed bar codes?
- By the endless method, bar codes are occasionally printed vertically to the drug name. Are they more readable than when they are printed horizontally?
- Do you consider "printing the bar code over each tablet", which was the most common among the 14 samples, to be more functional?
- If reading of the bar code of each tablet is necessary for drugs for internal use, such as for injection drugs, which is the optimal method for bar code printing?

2. Functionality/convenience of bar codes for dispensing by pharmacists

For dispensing by pharmacists, which bar code printing method is more functional and convenient was asked along with the reasons for the choice.

RESULTS

The results concerning the readability are shown in Fig. 3 and Fig. 4. Regarding the answers to questions 1- 2) "Which bar codes are more readable, those printed at the top (A/B) or those printed at the bottom (C)?", no marked difference was observed between the top and the bottom of the PTP sheet (Fig. 3-2). The answers to questions 1- 7) "If reading of the bar code of each tablet is necessary for drugs for internal use, such as for injection drugs, which is the optimal method for bar code printing?" varied (Fig. 4).

The graphs of bar code printing designs considered more functional/convenient and less functional/convenient during drug dispensing by pharmacists were nearly consistently opposite (Fig. 5).

Although the smallest number of pharmacists answered that the endless method is the more functional printing design than the pitch method, the same number of pharmacists answered "pitch method" and "neither of the above" (Fig. 6).

DISCUSSION

1. Printing method as a design for better readability

When the position of the bar code was evaluated from the viewpoint of "readability", there was little difference between the top and bottom of the PTP sheet, but there was a difference between the top (over the tablets) and the margin of the PTP sheet (Fig. 3-1, Fig. 3-2). This was considered to be due to distraction of vision to the drug name, which is printed in the same position when the bar code is printed over the tablets. Therefore, in this study, Transamin®250 mg was used as an example drug for which the bar code is printed at the bottom of the PTP sheet, but the difference between the top and bottom, as shown in pie chart 8, may have been smaller if a drug for which the bar code was printed over the tablets in the bottom row had been used instead of Transamin®250 mg, which has the bar code printed at the margin of the sheet.

Between boxed and non-boxed bar codes, the respondents considered boxed bar codes more readable (Fig. 3-3). The surface of the PTP sheet on which bar codes were printed was colorful and available in multiple colors for some drugs, but the bar codes were printed in one color for many drugs, including Calonal®200 mg and Furosemide®40 mg (Fig. 2-D, E). Therefore, the box is considered to draw attention to the bar code.

Regarding the direction of bar code printing, the respondents considered horizontally printed bar codes (in parallel with the drug name) more readable than vertically printed ones (perpendicular to the drug name) (Fig. 3-4). Drug names were always printed horizontally even for drugs on which bar codes were printed vertically, and this lack of uniformity was considered to affect the readability.

To the question, "Do you think printing the bar code over each tablet is more functional?", the largest number of pharmacists answered "more functional" and none answered "less functional", but 25.7% (9/35) answered "neither" (Fig. 3-5). The reasons for the answer "neither" included "The size of each bar code is reduced to print the bar code in the small space over each tablet", "The size of the drug name is reduced with increases in the number of bar codes printed", and "Reducing the size of the bar code may make them less readable". Even if bar codes may be read rapidly, the "small size of the drug name" is considered to pose a problem for checking the drug name.

The answers to the question about the "optimal bar code design if reading of the bar code of each tablet on a PTP sheet is necessary" varied (Fig. 4). We prepared the questionnaire on the assumption that bar codes printed over each tablet (each blister) are the most functional/convenient, but the number of tablets prescribed per patient is large in Japan, even for in-hospital prescriptions, and the condition, "if reading of the bar code of each tablet on a PTP sheet is necessary", was not considered realistic for hospital pharmacists. The greatest advantage of printing the bar code on each tablet (each blister) is that the bar code is ensured to remain if the PTP sheet is split, and this method is considered useful for the transfer of drugs between out-of-hospital pharmacies and handling rarely used drugs. In Japan, transfer of prescription drugs between hospitals or between a hospital and an out-of-hospital pharmacy is not approved. Therefore, the intent of the question may not have been conveyed effectively to the surveyed hospital pharmacists.

2. Functionality/convenience of bar codes for drug dispensing by pharmacists

As a functional/convenient design of bar code printing, G, in which the bar code was printed horizontally on each tablet, was most often selected, but the number of pharmacists who chose H, in which the bar code was printed on each tablet but vertically, was approximately half of those who selected G (Fig. 5). In addition to the reason shown in Question 1 (4), "horizontally printed bar codes are more readable than vertically printed ones", another reason for selecting G was "As multiple drugs are scanned by pharmacists during their work, uniform horizontal printing is more convenient." For "holding the PTP sheet with the left hand and reading

the bar code with the scanner held in the right hand", if the bar code is printed vertically, it is necessary to "turn the scanner or the drug 90 degrees". Therefore, horizontal printing of bar codes is also considered more reasonable from an ergonomic point of view.

As less convenient printing methods, A, B, and C, in which only 1 bar code is printed, were selected because "the bar code is lost when part of the PTP sheet is cut off" and because "It requires extra work to look for a sheet with the bar code (Fig. 5). Therefore, as a less convenient method, fewer pharmacists chose K, in which the bar code was printed at 2 places, and L, in which it was printed at 3 places, than I or J, in which the bar code was printed repeatedly at 1 place even by the endless method. The endless method is employed because of costs and printing efficiency, but a pharmacist surveyed in this study commented "I do not understand why they print bar codes that are cut in the middle."

To the question "Which is more functional, endless printing or pitch printing?", the pitch method was selected twice as frequently (Fig. 6). The reasons for not selecting the endless method included "I feel stress because bar codes that appear readable are sometimes unreadable," and "I hesitate over which bar code to read". Reasons for choosing the endless method were not found, but the reasons for selecting "neither" were "I do not see the difference", "I do not care", and "Either is fine as long as it is printed horizontally". As most of the pharmacists wrote reasons for "disliking the endless method" rather than reasons for preferring the pitch method, they were considered likely to have selected the pitch method by the process of elimination.

Concerning the other free comments, multiple pharmacists considered "the printing position of other information such as the drug name and expiration date", "space of the surface for bar code printing", and "ergonomics of holding the drug with the left hand and holding the scanner with the right hand" to be important.

Having a wide "space on the surface for bar code printing" is considered to control the complexity of the design and improve the readability. The position of printing of information other than the bar code, including the drug name, is considered to be an important factor for visual confirmation of the drug name during counting dispensing and smooth execution of rechecking after dispensing. "Ergonomics of holding the drug with the left hand and holding the scanner with the right hand" were suggested to be important for rapid reading of GS1 DataBars with minimum movements during the complex dispensing operation.

Questionnaire about distinguishability and readability of GS1 Data Bars

Age： years	Sex： M F	Experience as a pharmacist: years

★Please answer the questionnaire by referring to the accompanying materials.

1. Circle one of the suggested answers for each question that applies to you.

As the convenience/functionality of bar codes in operation is questioned separately, please answer (1)-(4) from the viewpoint of "readability" of GS1 Data Bars printed on PTP sheets.

1) Which are more readable, bar codes printed over the tablets as in (A) or those printed on the margin of the sheet as in (B)?
   - i. Over the tablets (A)
   - ii. On the margin of the sheet (B)
   - iii. No difference

2) Which are more readable, bar codes printed at the top (A/B) or those printed at the bottom (C)?
   - i. Top (A, B)
   - ii. Bottom (C)
   - iii. No difference

3) If bar codes are printed in the same position on the sheet, which are more readable, those with a box or those without a box?
   - i. Without a box (D)
   - ii. With a box (E)
   - iii. No difference

4) Which bar codes are more readable, those printed horizontally or those printed vertically (H, M, N)?
   - i. Horizontally
   - ii. Vertically (H, M, N)
   - iii. No difference

5) Do you think printing the bar code over each tablet is more functional?

i. More functional

ii. Less functional

iii. Neither

★ To the respondents who answered ii or iii for Question 5)

6) Concerning printing of G and H, comment freely about any aspects that need improvement.

〔 〕

7) If reading of the bar code of each tablet is necessary for drugs for internal use, such as for injection drugs, choose the one that you think is the optimal method for bar code printing from A-N.

〔 〕

2. Concerning the evaluation of GS1 Data Bars, circle all of your choices and comment freely about the reasons for your choices.

Question	Printing designs
Choose the printing designs that you think are functional/convenient for reading GS1 Data Bars during dispensing.	A B C D E F G H I J K L M N Free comment
Choose the printing designs that you think are not functional/convenient for reading GS1 Data Bars during dispensing.	A B C D E F G H I J K L M N Free comment
Which printing design do you think is more functional/convenient for reading GS1 Data Bars during drug dispensing?	Endless method / Pitch method / No preference Free comment

Thank you for your cooperation.

Figure 1: Questionnaire about GS1 DataBars on PTP sheets

GS1 DataBars	A	B	C	D	E
Number of bar codes printed on a PTP sheet	1	1	1	2	2
Position	Top	Top (margin)	Bottom	Top & bottom	Top & bottom
Box	Not boxed	Not boxed	Not boxed	Not boxed	Boxed
Printing direction	Horizontal	Horizontal	Horizontal	Horizontal	Horizontal

GS1 DataBars	F	G	H	I	J
Number of bar codes printed on a PTP sheet	5	6	10	Endless	Endless
Position	1 for each row	1 for each tablet	1 for each tablet	Top	Bottom
Box	Not boxed	Not boxed	Not boxed	Not boxed	Boxed
Printing direction	Horizontal	Horizontal	Vertical	Horizontal	Horizontal

GS1 DataBars	K	L	M	N
Number of bar codes printed on a PTP sheet	Endless	Endless	Endless	Endless
Position	2 places	3 places	Bottom	Top & bottom
Box	Boxed	Boxed	Boxed	Boxed
Printing direction	Horizontal	Horizontal	Horizontal	Vertical

Figure 2: Questionnaire about GS1 DataBars on PTP sheets (accompanying materials)

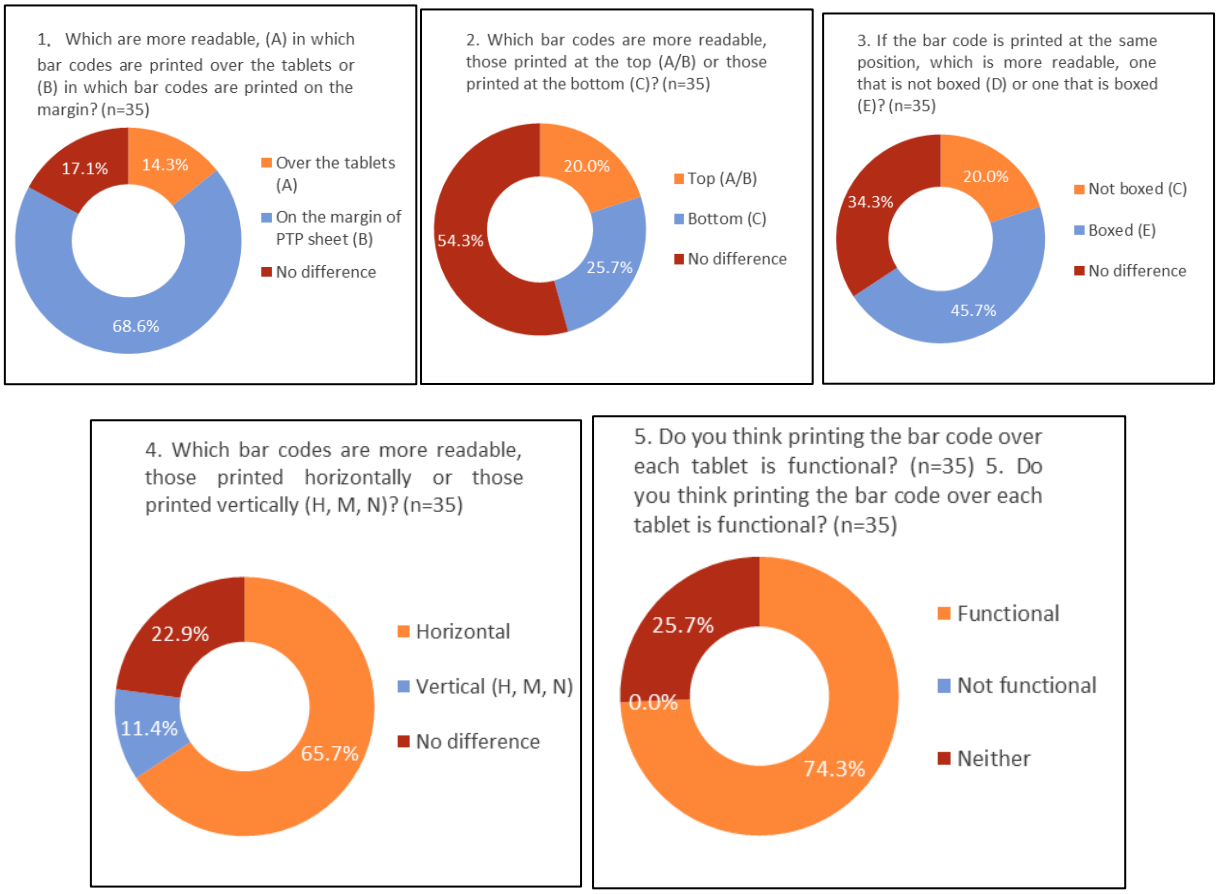


Figure 3: Bar code printing method as a design for better readability

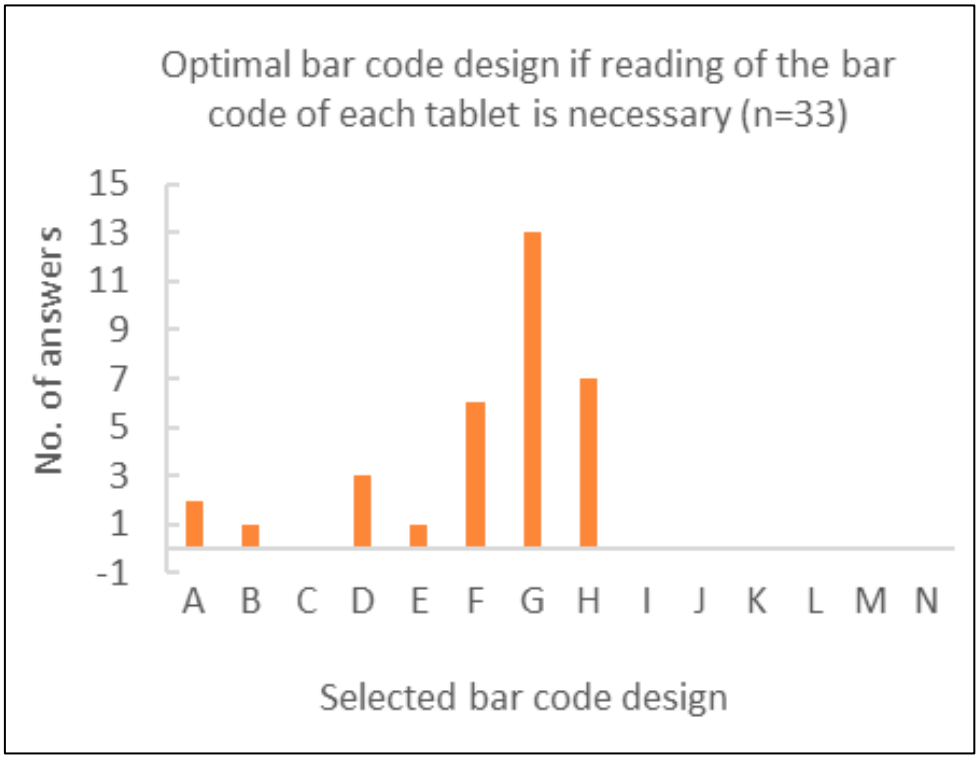
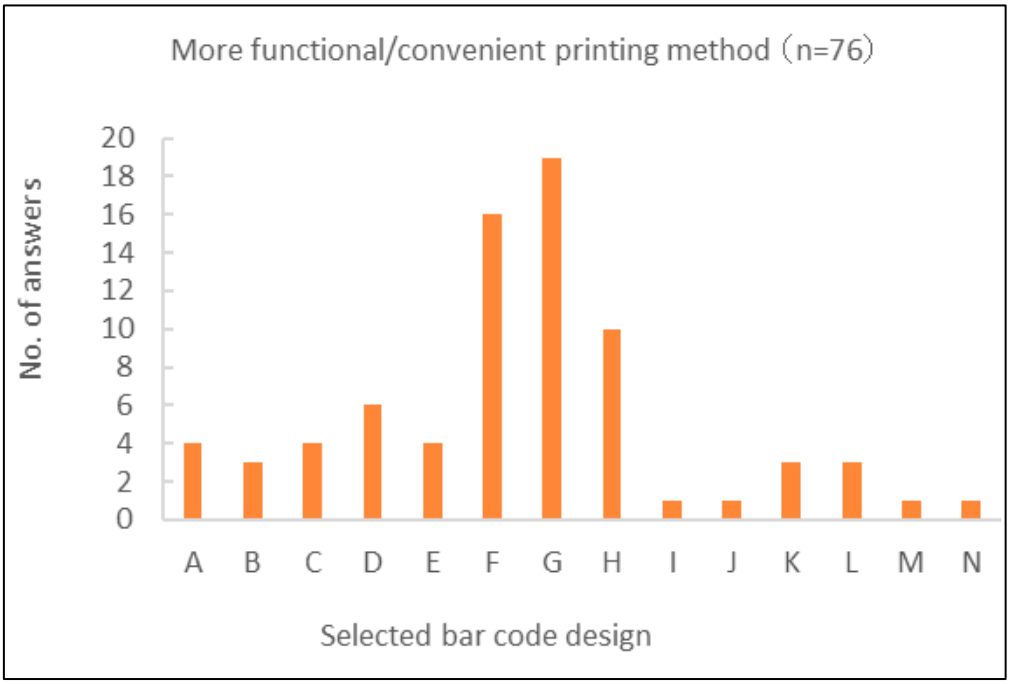


Figure 4: Optimal bar code design if reading of the bar code of each tablet on a PTP sheet is necessary



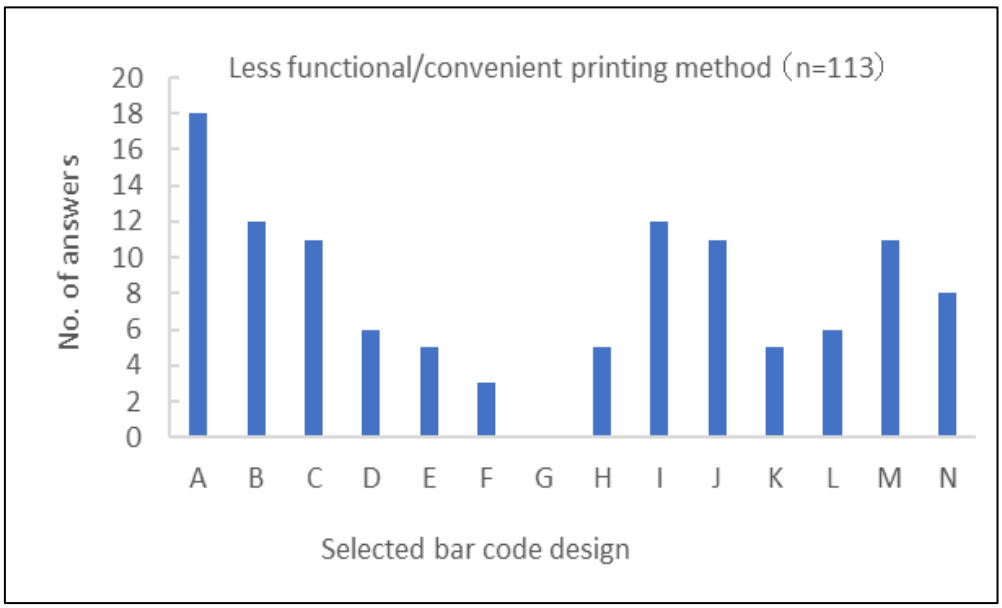


Figure 5: Functionality/convenience of bar codes for drug dispensing by pharmacists

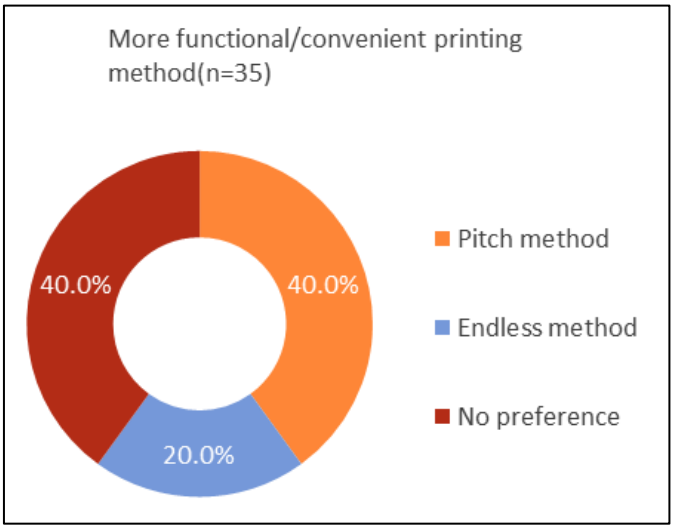


Figure 6: Functionality/convenience of different bar code printing methods

ACKNOWLEDGMENTS

We extracted and evaluated factors related to labeling with GS1 DataBars that are advantageous for confirming the drug name, specifications, and quantity at the time of dispensing, in addition to the readability of GS1 DataBars. In this study, pharmacists' perceptions concerning PTP sheets of drugs for internal use were evaluated. We will further investigate and evaluate other dosage forms in the future.

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