Construction and Analysis of Database on Outer Cases of Medicines

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Abstract. This study reduced the burden on medical staffs by determining 37 kinds of attributes based on the outer cases of medicines collected from seven pharmacies. We constructed a database on the outer cases of medicines and analysis of it provided useful knowledge.

Keywords: Outer case, openness, medicine.

1   Introduction

In medical settings, many problems burden medical staffs. For example, they must learn how to open the outer case of each kind of medicine. However, there are many different kinds of medicines, and the outer cases of each have their own shape and specification. The number of kinds of outer packages of medicines is almost the same as the number of the medicines. Medical staffs must learn how to open the outer cases of medicine. The fragments generated by opening cases may injure fingers. So we studied how to open the outer cases of medicines to reduce such inconvenience for medical staffs. We collected the disposed outer cases of medicines from pharmacies and constructed a database, which we analyzed to get useful knowledge related to their usability.

2   Construction of a Database on Outer Case of Medicines

At present, since no database exists about the outer cases of medicines, we decided to construct a new database on the outer case of medicines. First, we collected outer cases of medicines discarded from seven pharmacies, examined them, and determined 37 attributes. Table 1 lists the attributes and explanations. These attributes were classified into the following four kinds.

a.   Related to information on the surface of the outer case (11items)
b.   Related to ease of opening (9items)
c.   Related to capability to reseal and disposability (10items)
d.   Related to actual way of opening (7items)

Based on those attributes, we constructed a database of 1038 records.

Table 1. Attribute names and explanations

	Names	Description
Attributes related to information on outer case surface	JAN code	Japanese Article Number Code
	Name of medicine	Name of medicine
	Manufacturer	Name of manufacturer
	Actual producer	Name of producer
	Distributor	Name of distributor
	Dosage form	Dosage form of medicine
	Bulk	Bulk of medicine
	Surface of JAN code	Surface where JAN code is put
	Surface of GS-1data bar-code	Surface where GS-1 data bar-code is put
	Surface of expiration date	Surface where expiration date is put
	Type of GS-1 data bar-code	Type of GS-1 data bar-code
Attributes related to ease of opening	Suggested way of opening	How to open, suggested by pharmaceutical company
	Number of steps	Steps needed to open
	Sign to show place to open	With or without a sign to show place to open
	Arrow to show place to open	With or without a arrow to show place to open
	With or without fragment of paper	With or without a fragment when opened in suggested way
	Surface of opening	Surface with a place to open
	Side opened	Surface in which a cases are opened in suggested way
	Shape to be pushed	Point to push
	Versatility on dominant arm	With or without versatility on dominant arm

Table 1. (*continued*)

Attributes related to capability to reseal and disposability	Capability to reseal	With or without artifice to reseal a case
	Artifice to reseal	Artifice to reseal case
	Disposability	With or without artifice to dispose of case
	Artifice for disposal	Type of artifice for case disposal
	Prevention of tampering	With or without an artifice to determine whether case is opened or unopened
	Length	Length of outer case mm
	Width	Width of outer case mm
	Depth	Depth of outer case mm
	Three pictures	1) entire outer case, 2) closeup of start to open, 3) side with JAN code
	Remarks	Special instructions
Attributes related to actual way of opening	Pharmacy ID	ID's to distinguish different pharmacies
	Sequential number	Sequential number of each outer case for each pharmacy ID
	Agreement or disagreement	Agreement or disagreement between suggested way of opening and actual way
	Partly condition	
	Actual surface	Surface actually used for opening
	Condition of actual surface	Shape of side actually opened
	Actual way of opening	Actual way of opening a outer case

3   Analysis of Database on Outer Cases of Medicines

For each outer case, we compared the actual way of opening with the manufacturer's suggested way. Table 2 shows the numbers of agreement and disagreement between the actual and suggested ways. Except pharmacy A, in six pharmacies the rates of agreement exceeded 80%.

Table 3 lists the cross tabulations of the suggested ways of opening and the numbers of agreement and disagreement, except pharmacy A. It is clear that only the zipper-type has a high ratio of disagreement. Fig 1 shows examples of the actual ways of opening with the zipper-type.

We also analyzed the relations between the numbers of agreement and disagreement and the sizes of the outer cases. Fig 2 shows the analysis results. TwoStep clustering analysis was applied, and the results are as follows.

- Bigger cases tend to have a higher ratio of agreement.
- Width and depth are important for classifying clusters.
- There was no clear tendency for the smaller cases.

Table 2. Agreement or disagreement between suggested way of opening and actual way of open every pharmacy

Pharmacy ID	A	B	C	D	E	F	G
Agreement	24	130	7	187	216	133	88
Disagreement	158	24	0	7	25	9	19
Total	182	154	7	194	241	142	107
Rates of agreement (%)	13.2	84.4	100	96.4	89.6	93.7	82.2

Table 3. Cross tabulation of suggested way of opening and agreement or disagreement except pharmacy A

Suggested way of opening	Agreement or Disagreement		Total
	Agreement	Disagreement	
Push	499	19	518
Zipper	114	59	173
Pull	57	1	58
Push-pull	37	2	39
Tape	41	3	44
Others	10	0	10
Total	759	84	843

(a) Complete agreement	(b) Partial agreement
(c) Partial disagreement	(d) Complete disagreement
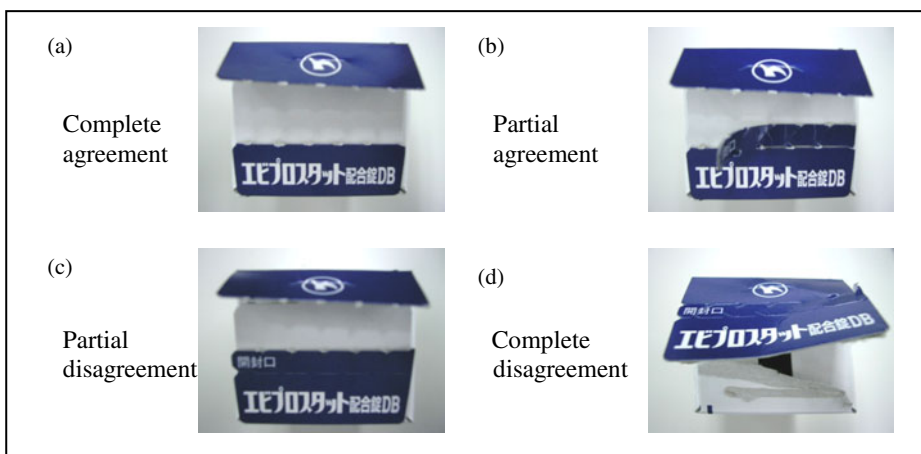
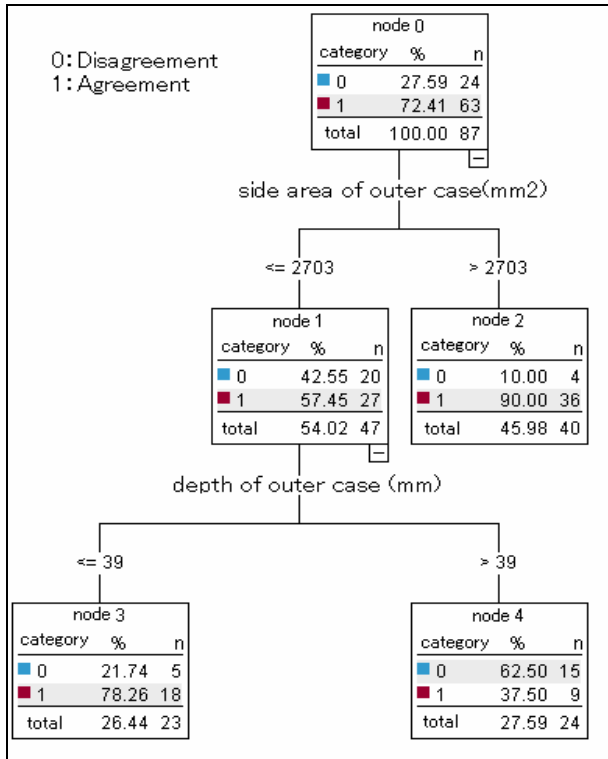**Fig. 1.** Examples of actual ways of opening zipper-type

Fig. 2. Binary tree by C5.0 algorithm

4 Discussion

The high ratio of agreement between the actual way of opening and the suggested ways of opening at six pharmacies indicated that at most pharmacies, many outer cases were opened as suggested by the pharmaceutical companies. The relatively high ratio of disagreement of the zipper-type cases suggests that problems may exist in those cases.

The analysis results by the C5.0 algorithm and TwoStep clustering suggest a relationship between the size of the outer case and ease of opening them. However, the ratio of agreement may be influenced by other factors.

5 Conclusion

In medical settings, many problems burden medical staffs. For example, they must learn how to open the outer cases of each kind of medicine. To reduce such

inconvenience, we determined the attributes of outer cases and constructed a database with them. Analysis results confirmed that the ways of opening differ between pharmacies. There were also problems in the outer cases of the zipper-type. In addition, the sizes of the cases are strongly related to the outer cases of medicines. However, there may be factors other than size for agreement.