A Study on Powdering of Reusable Surgical Gloves

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Objectives : *To study the need of powdering surgical gloves and to produce a powdering machine.*
Material and Method : *The need of powdering surgical gloves was done by questionnaires to directors or chiefs of purchase departments in 29 hospitals across the country. The practice in powdering surgical gloves was given by chiefs of the central sterile supply department (CSSD). A powdering machine was produced by the researchers in consultation with CSSD personnel in a hospital. The quality of powdering surgical gloves was evaluated by infection control nurses in the hospital. Cost comparison was done by a health economist.*
Results : *The study in 2002 revealed that all of the 29 hospitals used recycled surgical gloves. Powdering of surgical gloves was done by hand in 27.6% and by powdering machine in 62.10%. Corn powder was used in 55.2% and talc in 41.4%.Defects in powdering ranged from 1.1% to 51.7%. No defects was found in surgical gloves powdered by the machine produced by the researchers. The costs for powdering and one pair of reused surgical gloves were 0.10 and 5.59 baht respectively.*
Conclusion : *Surgical gloves were reused in all hospitals in Thailand. The powdering machine was effective and was not difficult to make.*

Keywords : *Powdering, Surgical gloves*

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Recycling of medical equipment is a common practice in developing countries. Surgical gloves are considered expensive and are reused in many countries. Gloves can be damaged during the recycling process and punctured gloves have been proved to increase the risk of surgical site infection[1,2] and of exposure to infection of the surgeons[3]. The powder on the gloves, especially latex gloves, is known to cause allergic illnesses[4,5], increase bacteria in the environment[5], surgical site infection, wound scar[6] and contaminate devices[7]. Despite the above consequences, reuse of surgical gloves is still necessary in most countries. Powdering is one necessary step in recycling surgical gloves. Defects in powdering are associated with difficulty in donning, tearing of gloves, uncomfortable feeling and complication by starch. A study on the need of a powdering machine was done in 2002 and a new model of powdering machine was made and tested during 2003 and 2004.

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Material and Method

The use of recycled surgical gloves and methods of powdering gloves were studied by sets of questionnaires to the directors/chiefs of purchase departments and chiefs of central sterile supply departments respectively. Twenty-nine hospitals were enrolled by stratified random sampling. Defects in powdering of surgical gloves of the studied hospitals were evaluated by co-ordinating infection control nurses. A powdering machine was made by the researchers with the advice of CSSD personnel in one hospital. The quality of powdering of the machine was evaluated by the researchers in the hospital. Cost analysis was done by a health economist.

Results

There were 29 hospitals enrolled in the present study (Table 1). They represented hospitals of differ-

ent sizes and locations in Thailand. The total number of beds, in-patients and operations are shown in Table 2. The number of surgical gloves purchased in 2001 was 1,287,865 pairs. The cost for one pair ranged from 5.7 to 32.0 baht. (40 baht = 1 U.S. dollar). The money spent on buying surgical gloves was 523.6 to 2,955 baht per bed per year and 26.9 to 151.6 for one operation. None of the hospitals used disposable surgical gloves. As shown in Table 3, 18 hospitals (62.1%) used a powdering machine while powdering by hands was practised in 8 (27.6%). In 3 hospitals (10.3%), modified machines were used. All governmental, regional and provincial hospitals used a powdering machine while powdering by hands was done in the 2 private hospitals. Different powders were used (Table 4). Corn starch was used most (55.2%) followed by talc (41.4%) and rice starch in only one hospital. Table 5 demonstrates the defects in powdering surgical gloves in the 29 hospitals. Powdering by hands was associated with more undesirable results (10.6%-41.2%). Defects were found in a high proportion of powdering machines (6.9%-26.4%). The powdering machine made by the researchers costed 100,000 baht with a capacity to powder 500 pairs of gloves in 7-10 minutes. The dust and noise

Table 1. Hospitals enrolled

Hospitals	No	%
University	3	10.3
Regional	5	17.2
Provincial	9	31.0
District	10	34.5
Private	2	6.9
Total	29	100

Table 2. Number of beds, in-patients and operations in 29 hospitals

Data	No
Beds	13,946
In-patients (year)	1,811,933
Operations	271,929

Table 3. Methods of powdering surgical gloves

Hospitals	No	Methods		
		By hands	Powdering machine	Other machine
University	3	-	2	1
Regional	5	-	5	-
Provincial	9	-	9	-
District	10	6	2	2
Private	2	2	-	-
Total	29	8 (27.6%)	18 (62.1%)	3 (10.3%)

Table 4. Types of powders used

Hospitals	Starch			
	Corn	Talc	Rice	Total
University	3	-	-	3
Regional	3	2	-	5
Provincial	4	5	-	9
District	4	5	1	10
Private	2	-	-	2
Total	16 (55.2%)	12 (41.4%)	1 (3.4%)	29

Table 5. Defects in powdering surgical gloves in 29 hospitals (%)

Defects	Hand (N=160)	Powdering Machine (N=360)	Other Machine (N=60)
Too thick	10.6	14.4	3.3
Too thin	36.2	6.9	5.0
Pellets of powder	15.6	1.1	3.3
Uneven	41.2	26.4	60.0

Table 6. Cost for recycling one pair of surgical gloves (baht)*

Items	Cost
Gloves**	1.98
Disinfectant	0.05
Powder	0.10
Autoclaving	2.98
Labor	0.48
Total	5.59

*40 baht = 1 U.S. dollar
**one pair of new gloves = 8.50 baht

generated by the machine were within permissible limits. On examining the powdered gloves by the machine, 4 pairs, before and after each autoclaving on 8 occasions, there were no defects in powdering of the 64 pairs of surgical gloves. The cost for powdering one pair of gloves was 0.10 baht (Table 6) and for one pair of recycled surgical gloves was 5.59 baht.

Discussion

From the present study, it can be concluded that, at the time of study in 2002, all hospitals in Thailand recycled surgical gloves, even in private hospitals. Powdering of surgical gloves was done by a specific machine in 62.1% and by hand in 27.6%. The latter exposes the operators to dust and increases the risks of allergic illnesses[4-8]. Defective powdering was found in all practices, being highest in powdering by hand (Table 4). Even when a powdering machine was used, defects were not uncommon. The powdering machine made by the researchers was simple and functioned very well. There were no defects defected in powdering with the machine. The cost for powdering was only 0.10 baht for one pair of surgical gloves (Table 6). The cost of one pair of recycled surgical gloves was 5.59 baht, less than the cheapest surgical gloves.

Conclusion

Reusable surgical gloves were used in all hospitals in Thailand in 2002. Defects in powdering reusable gloves were observed. A new powdering machine made by the researchers was effective.

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การศึกษาการคลุกแป้งถุงมือผ่าตัด

สมหวัง ด่านชัยวิจิตร, ไพโรจน์ สุวรรณสุทธิ, รัชดา เจิดรังษี, ยุวดี ตันติวัฒนาไพบูลย์

วัตถุประสงค์ : *ศึกษาความต้องการการคลุกแป้งบนถุงมือผ่าตัดและผลิตเครื่องคลุกแป้งถุงมือผ่าตัด*
วัสดุและวิธีการ : *ความต้องการการคลุกแป้งถุงมือผ่าตัดศึกษาโดยใช้แบบสอบถามผู้อำนวยการหรือหัวหน้าแผนกจัดซื้อของโรงพยาบาล 29 แห่ง หัวหน้าหน่วยจ่ายกลางให้ข้อมูลวิธีการคลุกแป้งในแต่ละโรงพยาบาล คณะผู้วิจัยได้ผลิตเครื่องคลุกแป้งถุงมือผ่าตัดโดยคำแนะนำของบุคลากรหน่วยจ่ายกลางของโรงพยาบาลแห่งหนึ่ง คุณภาพของการคลุกแป้งของเครื่องที่ประดิษฐ์ขึ้นประเมินโดยพยาบาลควบคุมโรคติดเชื้อในโรงพยาบาลเดียวกัน การประเมินราคาการดำเนินการคลุกแป้งและหมุนเวียนถุงมือผ่าตัดกระทำโดยนักเศรษฐศาสตร์ทางสุขภาพ*
ผลการศึกษา : *การศึกษาใน พ.ศ. 2545 พบว่าทุกโรงพยาบาล 29 แห่ง ที่ศึกษาใช้ถุงมือผ่าตัดที่หมุนเวียนใช้การคลุกแป้งถุงมือผ่าตัดกระทำด้วยมือ 27.6% และด้วยเครื่องคลุกแป้ง 62.1% ใช้แป้งข้าวโพด 55.2% และแป้งใยหิน 41.4% ข้อบกพร่องของการคลุกแป้ง พบตั้งแต่ 1.1% ถึง 51.7% ไม่พบข้อบกพร่องของการคลุกแป้งถุงมือผ่าตัดด้วยเครื่องที่สร้างขึ้น ค่าใช้จ่ายสำหรับการคลุกแป้งและถุงมือผ่าตัดที่หมุนเวียน 1 คู่เท่ากับ 0.10 และ 5.59 บาท ตามลำดับ*
สรุป : *ทุกโรงพยาบาลในประเทศไทยใช้ถุงมือผ่าตัดแบบหมุนเวียนใช้หลายครั้ง เครื่องคลุกแป้งมีประสิทธิภาพดีและสร้างไม่ยาก*