

# Management analysis for patient safety using GS1 standard codes

14.Dec. 09' GS1 Taiwan Healthcare Conference

**Kyoto Second Red Cross Hospital**  
**Kiyohito Tanaka**

# Practical use Unified code in the hospital

- Out line of K2RCH
- Strict Data storage for medicine usage and outcome
  - Routine injection and infusion on the ward
  - For OR
  - For Out patient
  - For Intensive care unit (ICU) and emergency center
- Strict data storage for medical materials and devices and outcome
  - Routine distribution
  - Operation room
  - Endoscopic center (reprocessing of endoscopy )

# The Outline of K2RCH

- 640 Beds (including ICU and NICU)

- Acute care hospital which incorporates a critical care center.

The numbers of emergency operations and nighttime operations are increasing year by year due to the recent medical environment in Japan.

6000 ambulance car/Year

- Department

Wards • • • 13 Out Patient 1800/day OR 11rooms

Cardio Vascular IVR : 1348, Brain IVR : 345, Abdominal IVR :

383

GI endoscopy : 14563

- Surgical Operation (2008)

Number of Operation 6257 Emergent Operation 1544

We have taken various approaches with Information and Communication Technology to safety management of hospital at K2RC.

We are going to introduce the approaches carried out at our hospital in this presentation

# Routine folw of injection and infusion

First of all, we are going to explain the operations of checking injections and infusions with handy terminals



At the pharmaceutical department, pharmaceutical chemists gather and confirm medications according to the sent injection orders. This operation is called 'Checking prescription'. Regarding gathering medications, in our hospital, an ampoule-picker takes medications automatically,

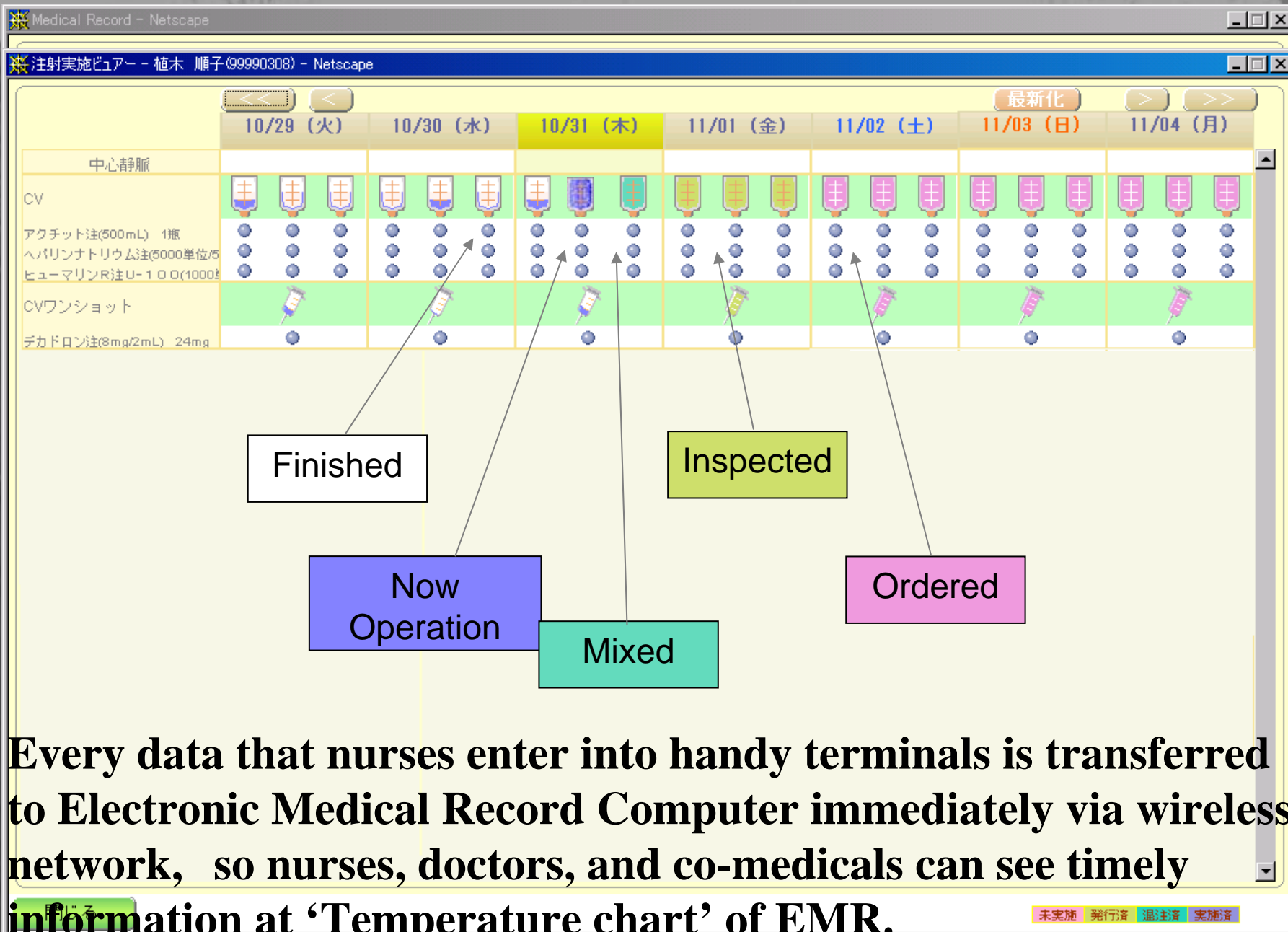
The pharmaceutical chemists put all the medications on the special trays separate them by each recipe on the basis of the prescriptions, and put

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At hospital wards, nurses check the medications if they are correct, and they mix the medications according to the required time, and the usage. When nurses mix the medications, they use handy terminals or bar code readers to confirm the information on the prescriptions and the ravel of the injections and the infusions.



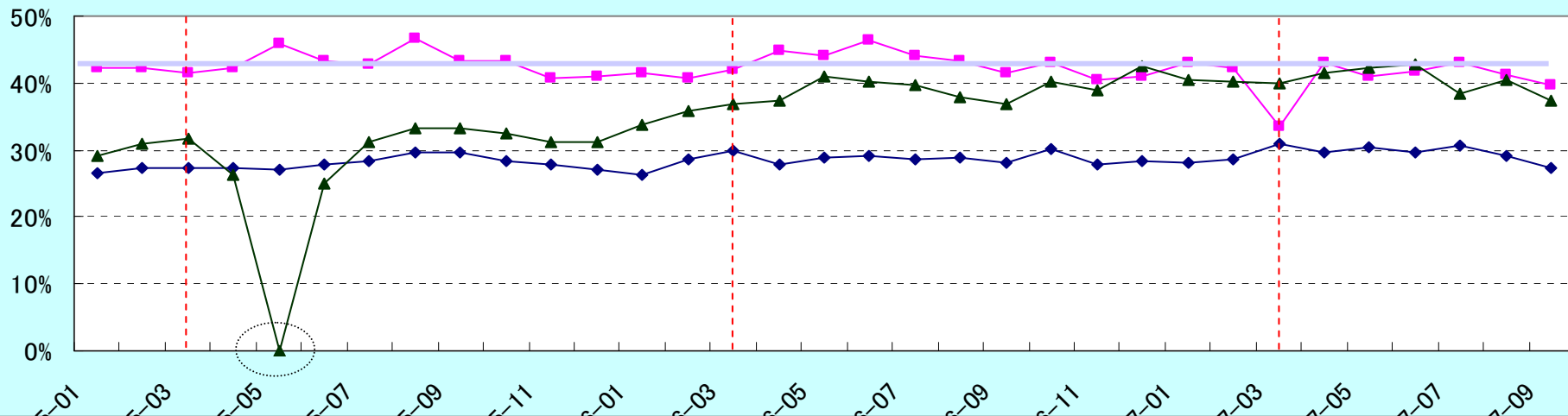
If there are any sudden changes of the orders, if the bottle of the inf infusion is wrong, or if the patient is mixed up, the handy terminal d with warning beep. Therefore nurses can proceed their work only when pr injections and infusions, and their patients are totally correct.



Every data that nurses enter into handy terminals is transferred to Electronic Medical Record Computer immediately via wireless network, so nurses, doctors, and co-medicals can see timely information at 'Temperature chart' of EMR.

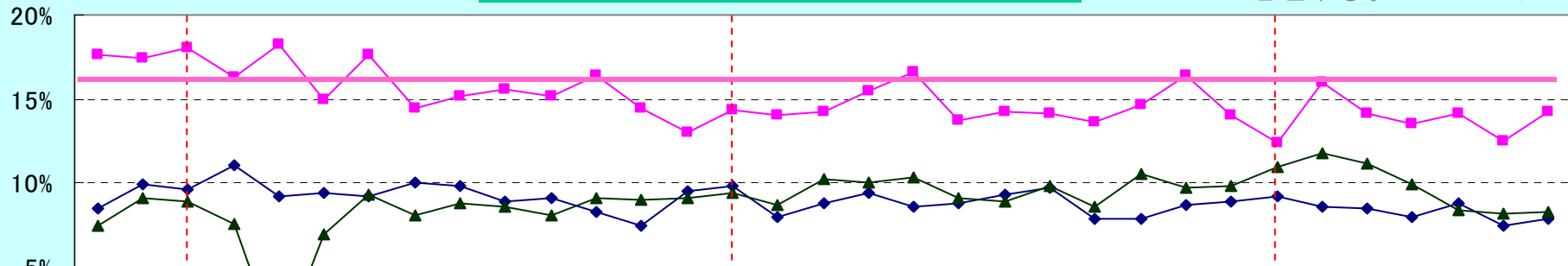
## Ratio of additional order and changing order

Ave. 43.2



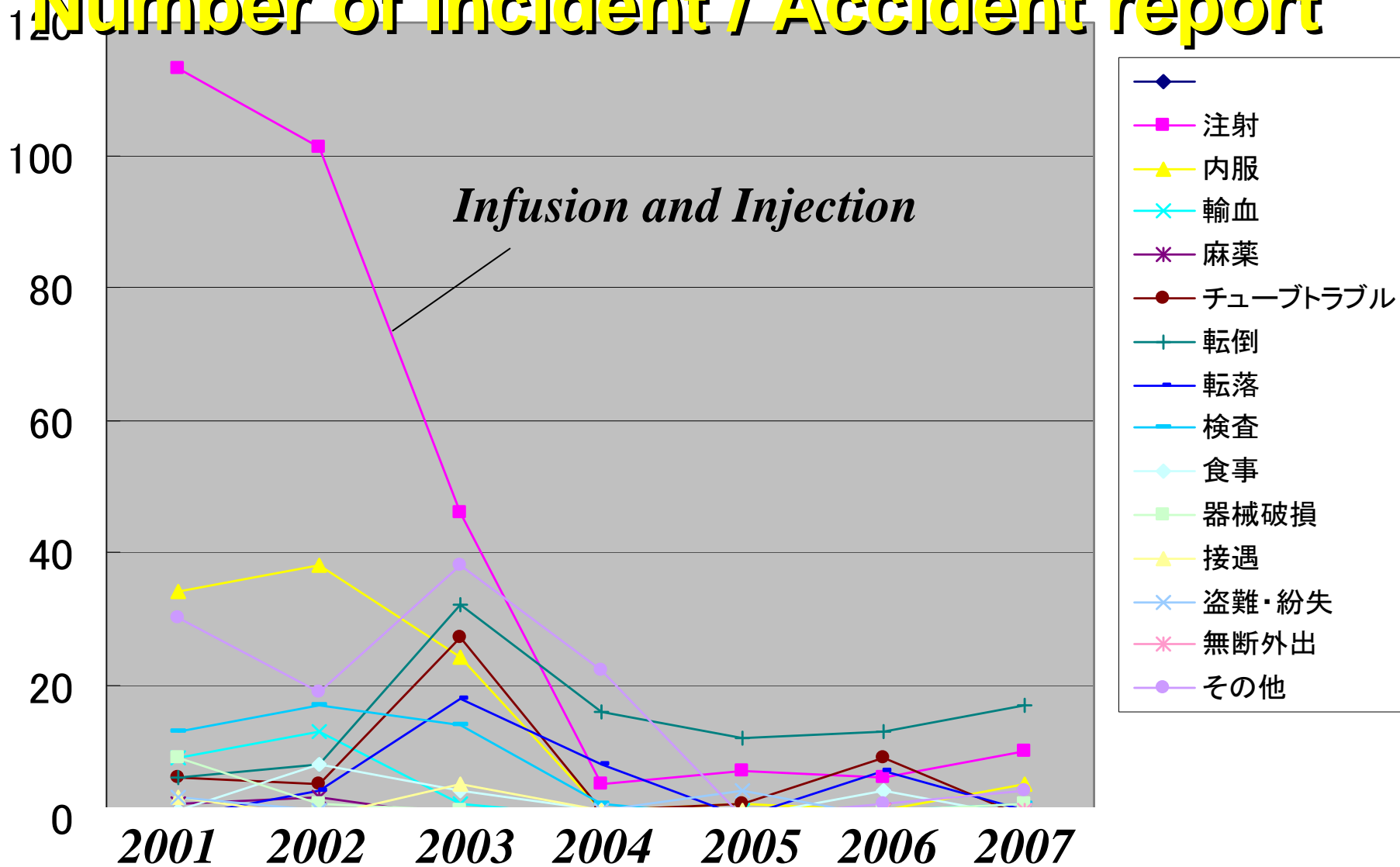
## Ratio of canceling order

Ave. 15.8



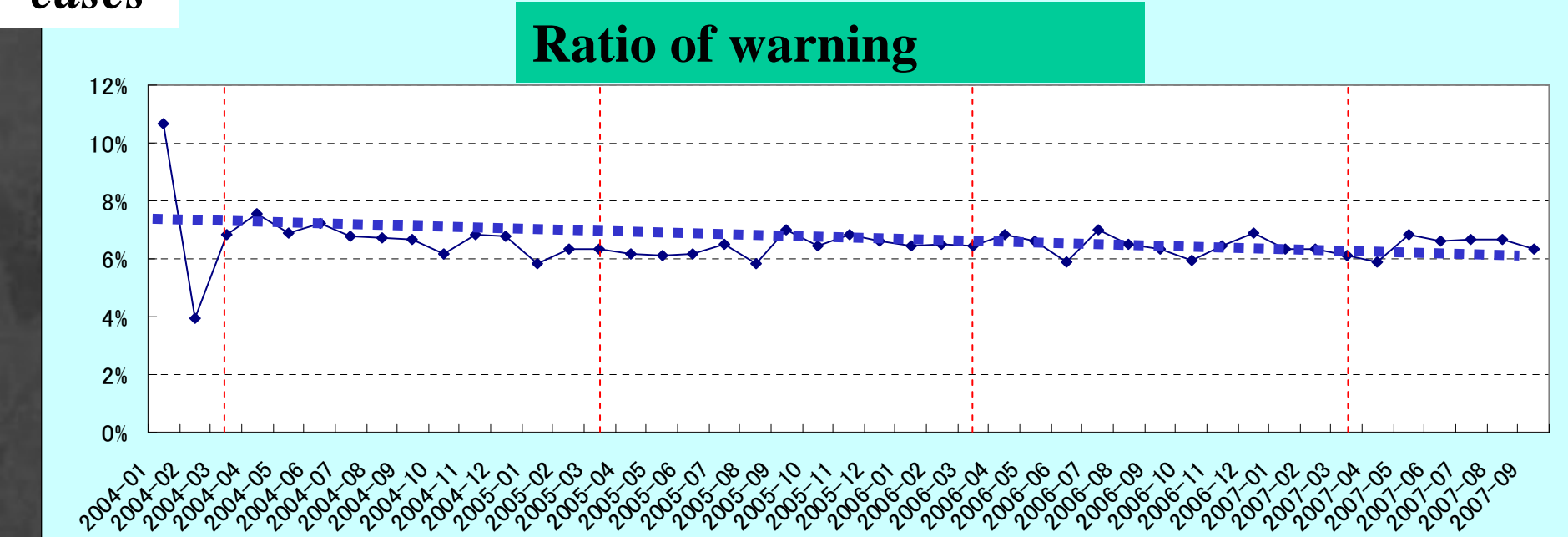
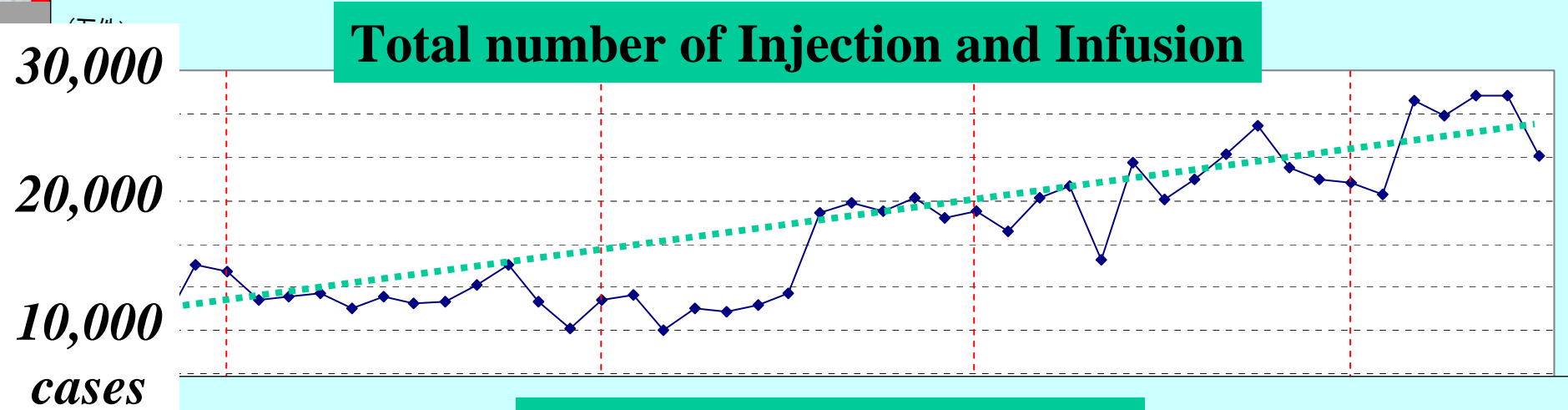
The numbers of emergency cases and nighttime operations are increasing year by year due to the recent medical environment in Japan. Japanese medical doctors should change or cancel orders of injection and infusion frequently. This injection and infusion check system can react changes in 1-2 seconds

# Number of Incident / Accident report



Since installation of this injection and infusion check system, Incident and accident cases are markedly decreased.

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In the total analysis during 4 years from installation of infusion check Total number of operation for injection and infusion was increased year year, however warning ratio was decreased.

In this way, checking system using unified code contribute toward not only patient safety, but also strict data storage about medical situations a environments

# Practical use GS1 code in the hospital

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- Strict data storage for medical instruments and devices and outcome
  - Routine distribution
  - Operation room
  - Endoscopic center (reprocessing of endoscopy )

Routine work about injection in the wards is so simple, checking system is very useful, however, since the orders of injections and drips are not placed before the uses in the OR and emergency cases, the usage data will be reflected to the distribution system only after the actual use.

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Precise history tracking of the medications is also possible by utilizing the bar code attached on the medication cart. The scanned information of the medications and medical devices will be reflected to the distribution system and purchase orders will be placed automatically based on the preset quantity of inventory.

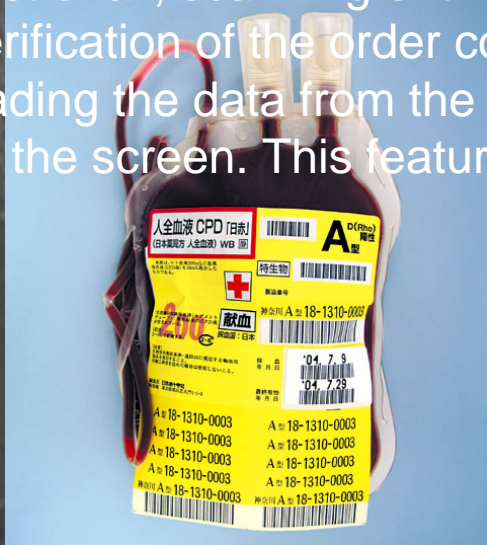
The list of used medicines will be printed out at the pharmaceutical department and the precise quantity will be replenished on the medicine cart.



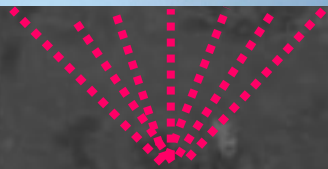
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For blood transfusion, confirmation of the blood product, patient's blood type and the usage schedule is possible with this system.

First of all, scanning of the bar code on the prepared blood product is performed. Verification of the order contents and transfusion handover information is possible by loading the data from the server. If the verification fails, an error message will appear on the screen. This feature achieves a safe blood transfusion.



Transfusion verification





患者様から受け取ったカルテから  
名前と処方内容を確認します

In the outpatient unit, we are using the real time medicine management system called “LITERA” manufactured by TOSH0.

First of all, a nurse confirms the injection and drip orders for outpatients, then verifies staff’s ID and retrieves the patient information by using the ID card of the patient.

Once ampoules are picked from the medicine management system, the types of the medicines and quantities will automatically be retrieved and the data will be transferred to the pharmaceutical department.

If a wrong ampoule is picked up, it can be returned to the system by following the direction of the display.

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Microsoft Excel - 20070919\_全件データ

ファイル(E) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ(H)

MS Pゴシック 11 B I U % 75%

AV2488	A	AJ	AK	1%
患者ID	入室時間	麻酔		
2475	98	2007/08/28 19:05		1%プロポフォル注「マルイシ」200mg20ml1管 (5管),サージセル 綿型II (シート) 綿型5. 1X2. 5 (10枚),ドブボン注0. 1%シリンジ 50ml1筒 (5筒),サリンヘス 6%500ml1瓶 (10袋),アクチット注 500ml1瓶 (20瓶),ノボヘパリン注 5千単位 5mL1瓶 (5mLバイアルX5瓶),ワッサー「フソー」-PL 20mL1管 (50管),ワゴスチグミン注0. 5mg 0. 05%1ml1管 (50管),ロピオン注 50mg50ml1管 (10管),硫酸アトロピン注射液0. 5mg「タナベ」0. 05%1ml1管 (50管),マスキュラックス静注 10mg 10mg1瓶 (10瓶),フィシザルツ-FC500ml 500ml1袋 (20袋),タココンプレギュラー 1枚,生理食塩水広口 500ml 500ml1瓶 (30瓶),キシロカイン ポリアンプ 1% 1%10mL1管 (10管),アナペイン注2mg/mL 0. 2%100ml1袋,エフェドリン「ナガサ」注射液40mg 4%1ml1管 (10管),大塚生食注 100ml 100ml1管 (10瓶),大塚生食注 20ml 20ml1瓶 (50管),ヴィーンF注 500ml1瓶 (20瓶)
2476	54	2007/08/29 16:55		
2483	81	2007/08/30 14:25		
2488	66	2007/09/03 08:55		
2520	68	2007/09/05 08:45		
2534	81	2007/09/04 08:45	2007/09/04 2007/09/04 13:05	2007/09/04 280 190 260
2535	14	2007/09/04 13:31	2007/09/04 2007/09/04 15:33	2007/09/04 123 76 122
2536	70	2007/09/07 09:00	2007/09/07 2007/09/07 10:40	2007/09/07 114 60 100
2545	36	2007/09/03 09:35	2007/09/03 2007/09/03 12:10	2007/09/03 225 140 155
2559	30	2007/09/03 13:50	2007/09/03 2007/09/03 16:25	2007/09/03 155 115 155
2561	88	2007/09/07 08:33	2007/09/07 2007/09/07 10:03	2007/09/07 90 44 90
2563	80	2007/09/06 09:10	2007/09/06 2007/09/06 11:30	2007/09/06 155 105 140
2579	89	2007/08/31 22:05	2007/08/31 2007/09/01 01:01	2007/09/01 182 132 176
2580	63	2007/09/01 13:00	2007/09/01 2007/09/01 14:30	2007/09/01 95 35 90
2593	17	2007/09/06 08:20	2007/09/06 2007/09/06 10:32	2007/09/06 140 96 132
2600	20	2007/09/06 10:35	2007/09/06 2007/09/06 14:00	2007/09/06 228 161 205
2605	05	2007/09/10 13:15	2007/09/10 2007/09/10 15:40	2007/09/10 169 95 145
2615	09	2007/09/11 16:49	2007/09/11 2007/09/11 18:38	2007/09/11 128 87 109
2638	40	2007/09/14 09:05	2007/09/14 2007/09/14 11:00	2007/09/14 120 75 115
2641	58	2007/09/12 08:50	2007/09/12 2007/09/12 11:10	2007/09/12 160 95 140
2680	83	2007/09/11 13:25	2007/09/11 2007/09/11 17:55	2007/09/11 298 220 270
2683	52	2007/09/13 09:00	2007/09/13 2007/09/13 12:09	2007/09/13 225 125 189
2685	00	2007/09/11 08:35	2007/09/11 2007/09/11 11:55	2007/09/11 207 155 200
2686	40	2007/09/14 08:50	2007/09/14 2007/09/14 16:30	2007/09/14 485 410 460
2687	50	2007/09/10 08:55	2007/09/10 2007/09/10 11:20	2007/09/10 175 105 145
2690	67	2007/09/11 08:55	2007/09/11 2007/09/11 11:50	2007/09/11 205 130 175
2691	91	2007/09/10 08:40	2007/09/10 2007/09/10 11:20	2007/09/10 165 100 160
2695	09	2007/09/07 15:40	2007/09/07 2007/09/07 16:46	2007/09/07 75 30 66
2699	64	2007/09/08 14:24	2007/09/08 2007/09/08 16:20	2007/09/08 132 97 116
2702	02	2007/09/13 08:30	2007/09/13 2007/09/13 13:15	2007/09/13 273 190 285
2703	03	2007/09/09 23:15	2007/09/09 2007/09/10 00:35	2007/09/10 85 40 80

Basic reports like as monthly and daily reports and operation data can be output as CSV format files. This will enable data analysis of used medications and devices for each operation.

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In this way, we can make strict storage of medicines at hospital ward and every department in our hospital. Next issue is medical materials.

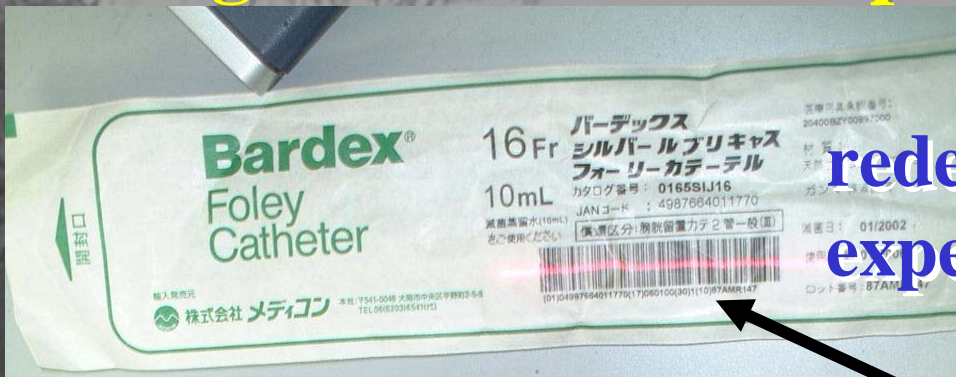
The characteristic feature of our system is that the consumption status of medical materials can be managed by the individual item unit.

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In inspection, both the pink sticker which is a unique barcode for our in-hospital distribution and the GS-1 code which is attached on the medical material are scanned in order to mutually link the two codes. When inspecting the received materials, the pink barcode, GS-1 barcode, delivery date and delivery time information will be linked. Therefore, all materials are managed by the GS-1 barcode and serial code so that scanning only the in-hospital barcode will enable acquisition of consumption data of each unit.



# Management of consumption : Each patient



redeemable devices by insurance  
expensive devices

By using resource marked GS1 code  
Manage by each devices for each patient



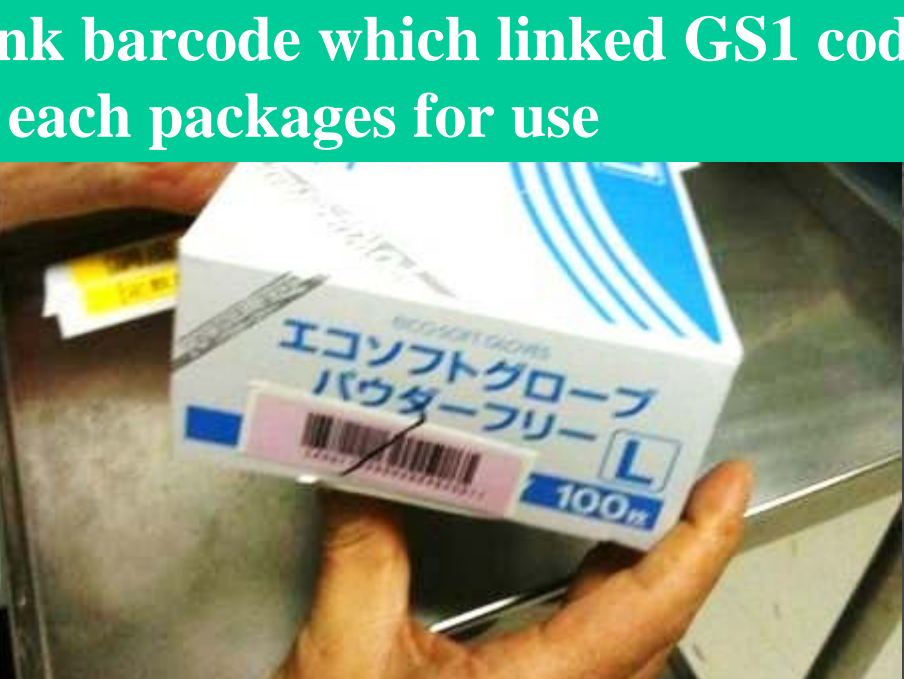
Check the data of consumption  
by using handy terminals which  
used for injection and infusion  
check

# Management of consumption : Each package



**Inexpensive devices**  
**Low risk devices**

**By using pink barcode which linked GS1 code**  
**Manage by each packages for use**



# Management of consumption : Each package

No resource marking materials



For the no resource marking materials like that, we attached GS1 code by using distribution system in hospital. No resource marking materials are remaining yet. This is

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	A	B	C	D	E
1	ID	部門名	合計 / 1日分定数 購入金額	合計 / 10月1日平 均払出金額	比率
2	OR		11,377,271	982,445	8.6%
3	Endoscopic center		3,276,973	128,669	3.9%
4	ICU		2,119,206	180,256	8.5%
5	Radiology		1,918,541	234,080	12.2%
6	ER		602,138	54,249	9.0%
7	Urology		540,552	24,911	4.6%
8	Emergency center ward		489,382	47,094	9.6%
9	Central sterilization center		397,894	63,957	16.1%
10	Cardio vascular ward		384,586	47,151	12.3%
11	Surgical ward		293,288	25,004	8.5%
12	Hemofiltration center		293,140	8,917	3.0%
13	Internal medicine ward		283,889	16,743	5.9%
14	Pediatrics ward		238,082	23,450	9.8%
15	Plastic surgery		218,308	1,971	0.9%
16	Neuro surgery		216,312	21,671	10.0%
17	Internal medicine ward (DM)		189,414		
18	Orthopedics ward		182,824		
19	Gynecological ward		178,421		

<b>OR</b>	11,377,271
<b>Endoscopic center</b>	3,276,973

Strict data storage can be done using distribution systems about consumption each division, however, for management of hospital, we should get the strict data by each department and each operative procedures. Especially, OR and endoscopic center is highest costing division. In OR 100 thousand in one day US dollars materials are prepared,

## Enter equipment and drugs used for procedure

This is a function to input information of devices and medications used in the procedure. Input items includes information of medical devices and supplies by scanning the GS1 bar code with the handy terminal.



# Management data

*Each department*

	A	B	C	D	E	F	G	H	I	J	K	
1	合計 / 払出金額			年月								
2	部門名	診療材料 flag	診療科	200801	200802	200803	200804	200805	200806	200807	200808	
3	手術室	診療材料	00診療科配賦不可	10,535,088	11,747,613	10,852,266	12,045,619	10,526,849	11,460,496	13,921,978	12,751,111	
4			00診療科判断不明	3,865,548	3,949,191	4,267,203	5,232,226	4,005,882	4,269,380	5,471,226	5,401,111	
5		Orthopedics			26,663,459	15,930,913	14,519,220	20,028,107	19,325,424	23,292,944	27,774,260	25,321,111
6		Cardiovascular surg.			11,294,059	17,468,063	15,850,273	15,281,027	11,906,257	10,976,164	15,315,973	14,191,111
7		Surgical (abdomen)			3,621,504	4,642,680	3,815,395	3,512,551	4,444,150	4,091,812	4,063,963	4,971,111
8		Eyes			3,875,064	3,711,947	4,119,808	4,389,535	3,074,089	3,156,561	2,950,101	3,051,111
9		Surgical (general)			2,661,296	3,475,574	2,340,339	2,753,127	2,051,930	2,273,154	2,373,203	3,861,111
10		Neurosurgery			2,119,022	1,535,002	1,572,701	1,678,914	1,820,689	1,338,761	6,833,492	4,091,111
11		Urology			796,688	815,826	904,554	756,666	573,417	1,311,860	1,058,892	1,061,111
12		Anesthesia			292,124	364,241	433,935	355,099	385,375	447,224	400,287	451,111
13		Plastic surg.			265,797	113,652	187,782	208,446	174,174	223,860	253,386	253,386
14		Gynecology			68,472	89,160	134,250	122,970	112,200	90,150	146,595	81,111
15		Lryngopharynx										
16		GI					4,300		8,600	17,200	4,300	
17		Renal med.						4,725				
18									9,460			
19			診療材料 集計		66,058,121	63,843,862	59,002,026	66,369,012	58,418,496	62,949,566	80,567,656	75,271,111
20			対象外 (空白)		1,466,151	1,161,879	627,640	816,353	2,222,329	3,940,692	507,494	1,761,111
21			対象外 集計		1,466,151	1,161,879	627,640	816,353	2,222,329	3,940,692	507,494	1,761,111
22	総計			67,524,272	65,005,741	59,629,666	67,185,365	60,640,825	66,890,258	81,075,150	77,041,111	
23												
24												
25												
26												



# Management data of surgical operation

	A	B	C	F	F	G	K	L	MNC	P	Q	U	V
	Income					cost							
	Procedure	No. Treatment	Material	Total	materials	medicine	Total						
1	Coronary Aorta bypass graft	1	0 0	130780	130780	130780	277250	301759	579009	579009			
1	Endoscopic op for sinusitis	33	7689000 0	306080	242275	7995080	442335	69737	15517	512072			
1	Implantation of optical lens	185	22385000 0	2523	121014	22387523	6406	5607041	30343	5613447			
2	TUR-Bladder	38	3952000 0	117459	107091	4069459	80023	236659	8334	316682			
2	Inguinal hernia	33	1980000 0	270896	68209	2250896	712206	49716	23089	761922			
3	Appendectomy	26	1614600 0	29690	63242	1644290	58929	60896	4609	119825			
3	Kaiser	57	8550000 0	210691	153696	8760691	259990	136412	6954	396402			
3	Laparoscopic cholecystectomy										66197	3177438	

	A	B	W	X	Y
1	Income				
2	Procedure	Average	JP Yen	Ratio	
3					
	Coronary Aorta bypass graft	-448229	-448229	-343%	
	Endoscopic op for sinusitis	226758	7483008	94%	
	Implantation of optical lens	90671	16774076	75%	
	TUR-Bladder	98757	3752777	92%	
	Inguinal hernia	45120	1488974	66%	
	Appendectomy	58633	1524465	93%	
	Kaiser	146742	8364289	95%	
	Laparoscopic cholecystectomy	140203	6729724	68%	

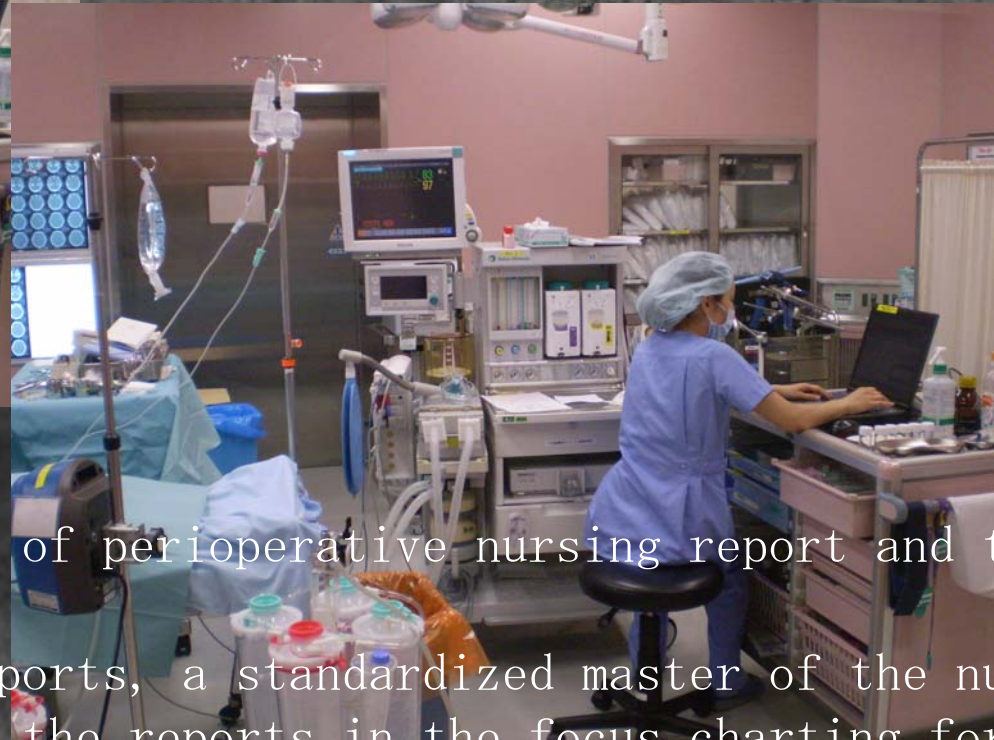
## Another functions of OR management system

### 2. Patient verification



Now confirm the operation schedule on the handy terminal, select the patient name and the type of operation, then verify the patient by scanning the bar code on patient's wrist. Crosscheck of the schedule information and the patient information will achieve the safe delivery of the patient into OR.

## Another functions of OR management system



The system has recording functions of perioperative nursing report and nursing schedule planning. Regarding the record of nursing reports, a standardized master of the nursing reports is created, so that writing the reports in the focus charting form is possible. Moreover, the system is equipped with the free drawing function and preset schema for indicating the location of drainage stents etc.. Additional reporting topics and free text input by using terminal computer is also possible.

# Direct effect for staffs of OR management system

Solemio OR WEB - Microsoft Internet Explorer  
http://10.100.199.1/ReportMain.asp

**Solemio OR** 京都第二赤十字病院 手術室業務支援システム

間接介助者: 0 572

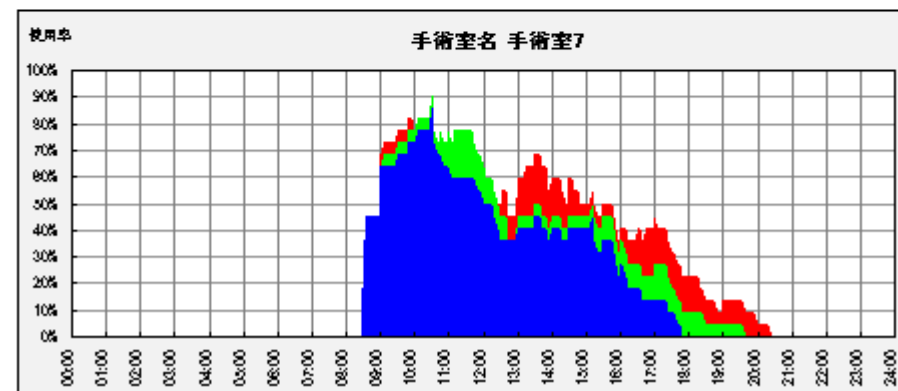
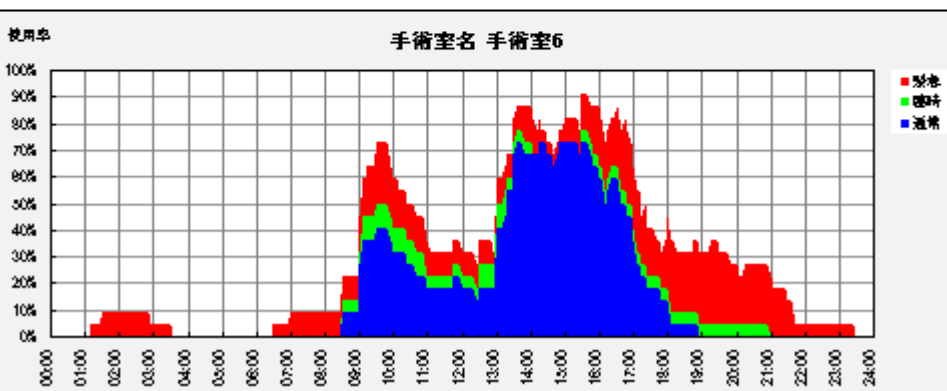
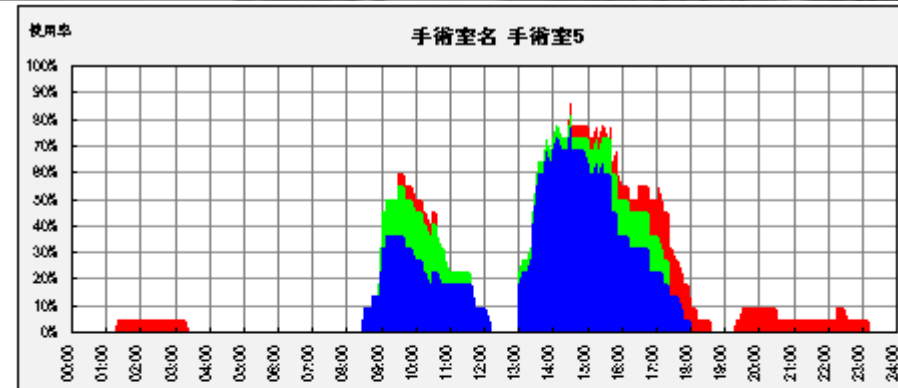
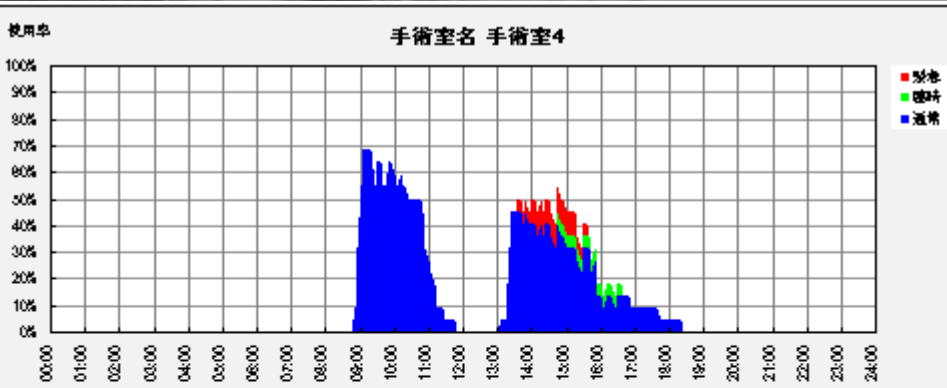
人体図:

静脈ライン V① 16 G  
静脈ライン V② 18 G  
動脈ライン A 左手・右手  
バルン 16 Fr 水 5 cc  
切開創 ナイロン…左ソケイ  
埋没…胸部

- ① 心臓内
- ② 胸骨下
- ③ 右胸クウ内
- ④
- ⑤

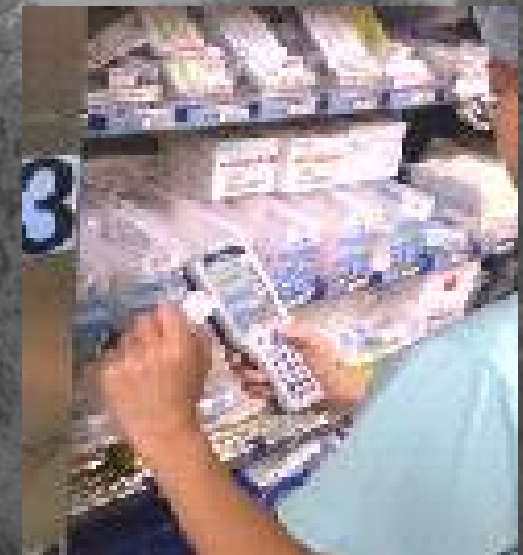
The schema function of the system provides information such as locations of operation wounds. Nursing reports and other information can also be viewed in the hospital wards.

# Rate of operation room by each OR room



By using this perioperative management system, various data can be managed. These tables are useful use ration of operation room. By each OR room, using rate by time is available.

# Picking tool of preparation for operation



中垂切除術

棚番 **A-10-3-12** 進捗 29/54

コーティッドバイクリル 白 2-0  
45cmx8本入 鈍エチカ...

EAN 1030490390296

製品番号 JB947



数量

0/2

別画像表示

中断 OK 欠品 スキップ

虫垂切除術

棚番 **A-10-3-12** 進捗 29/54

コーティッドバイクリル 白 2-0  
45cmx8本入 鈍エチカ...

EAN 1030490390296

製品番号 JB947



数量

1/2

別画像表示

中断 **OK** 欠品 スキップ

虫垂切除術

棚番 **A-12-4-1** 進捗 30/54

テルモシリンジ

EAN 1078950360296

製品番号 THSF35-300AES...



数量

0/3

別画像表示

中断 OK 欠品 スキップ

# Result of investigation

## -Ratio of resource marking by GS1 code in medical materials-

### 2. 調査結果(概要)

- (1) 医療機器全体では、規格(品目)におけるJAN商品コード取得割合は約9割、MEDIS-DCデータベース登録割合は約5割、バーコード貼付割合は約8割となっている。
- (2) 医療材料では、規格(品目)におけるJAN商品コード取得割合は約10割、MEDIS-DCデータベース登録割合は約6割、バーコード貼付割合は約9割となっている。  
このうち特定保険医療材料については、規格(品目)におけるJAN商品コード取得割合は10割近くに達し、MEDIS-DCデータベース登録割合は約7割、バーコード貼付割合は約9割となっている。
- (3) 医療機械では、規格(品目)におけるJAN商品コード取得割合は約8割、MEDIS-DCデータベース登録割合は約4割、バーコード貼付割合は約5割となっている。  
このうち特定保守管理医療機器については、規格(品目)におけるJAN商品コード取得割合は約8割、MEDIS-DCデータベース登録割合は約3割、バーコード貼付割合は約5割となっている。
- (4) 体外診断用医薬品では、規格(品目)におけるJAN商品コード取得割合は約10割、MEDIS-DCデータベース登録割合は約4割、バーコード貼付割合は約8割となっている。

In this way, various management data and strict data storage can be by using GS1 code.

The ratio of resource marking by JAN code is relative high in Japan. This data is the result of investigation by Japanese government, this shows that in medical materials unified code is attached about 90 %

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洗浄状況一覧

更新

# 洗浄残り時間表示

洗浄装置名	スコープ名	開始時間	終了予定時間	残り時間
洗浄機1	GIF-H260	10:00	10:20	15分
洗浄機2	GIF-XQ260	9:49	10:09	4分
洗浄機3	GIF-H260	9:46	10:06	1分



## **Practical use is most important**

- Serial number data is not necessary for all items.
- Lot number is enough for practical use.
- GS1 is enough for usage, not SGTIN in hospital
- For the patient safety
  - For general injection and infusion  $\Rightarrow$  GS1
  - For blood product  $\Rightarrow$  Serial management
- Covering for all department of hospital
- Distribution system is very useful
  - High risk devices, Expensive materials  
 $\Rightarrow$  each patient
  - Low risk devices, Inexpensive materials  
 $\Rightarrow$  each package

## Utilization of data Strict data storage

- Data analysis of distribution system data is so important.
- Management data is made from strict storage data.
- For effective use of ICT system, labor saving of stuffs

Also staffs can utilize the data stored in these systems by using GS1 and unified codes, which is about the number of given injections for a day, or the busiest time of a day.

This information is very useful for understanding exact trend of the work, and management of the organization.

We believe that computerization at hospitals should be beneficial for patients. So adding nursing functions to EMR that is usually made for doctors can be a big help to establish medical systems that benefits patients.

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