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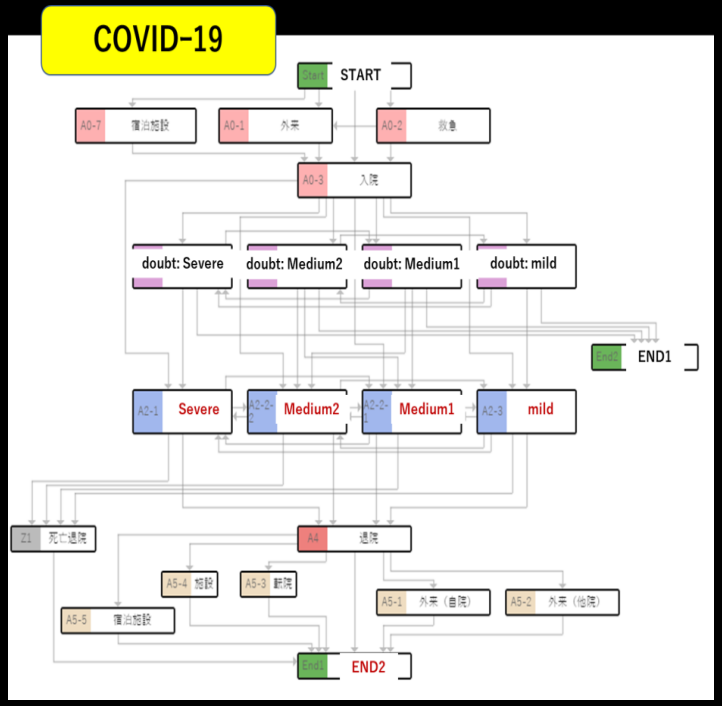

Effectiveness of clinical management of COVID-19 based on structured clinical knowledge and process paths

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1. Introduction

- In hospitals, it takes time to train medical personnel, it is important to at least prevent existing medical personnel, **especially nurses, from leaving their jobs.**
- We have developed a clinical management system based on structured clinical knowledge and process paths, which aims to reduce the levels of disruption and stress pandemics cause in hospitals.

- **The purpose of this study was to analyze the effectiveness of this system.**
- In this paper, the effectiveness of the system was examined after its implementation by focusing on the turnover rate of nursing staff.

2. Methods *Infrastructure enhancement (2017-2019): development of a clinical process support system using structured clinical knowledge and its implementation in hospitals*

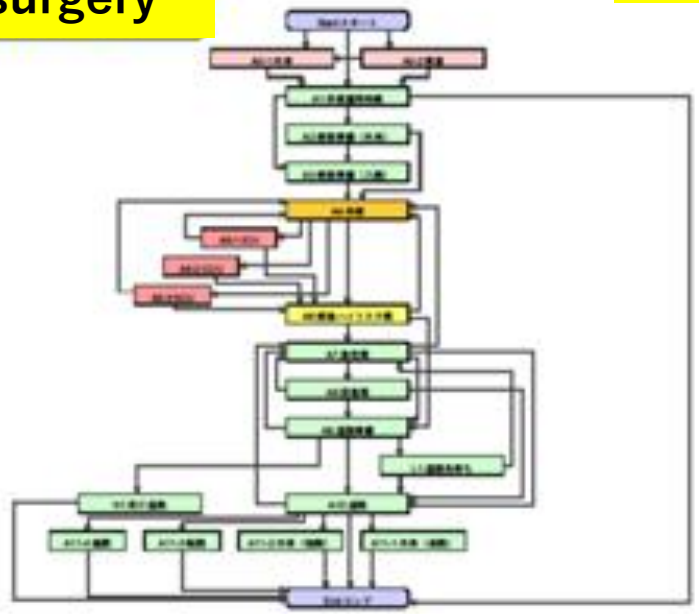
- Since 2004, Tsuru, Iizuka et al. have been developing a clinical pathway system, incorporating structured clinical knowledge (PCAPS).
- In 2018 , Nakao, Tsuru, et al. developed an IT application and implemented it in hospital S (350 beds).
- Tsuru, Tamamoto, Nakao et al. developed system, which was named Team Compass with PCAPS, was implemented in hospital N (900 beds, a university hospital) in May 2019. As a result, 730 process paths were typified at the university hospital. Structured clinical knowledge relating to nursing was incorporated into each of the units that made up the process paths.

➢ Reduction of nurses' overtime hours for recording using these digital path contents and the application.
  - ✓ 27% at a 900-bed university hospital
  - ✓ 40-50% at a 400-bed general hospital

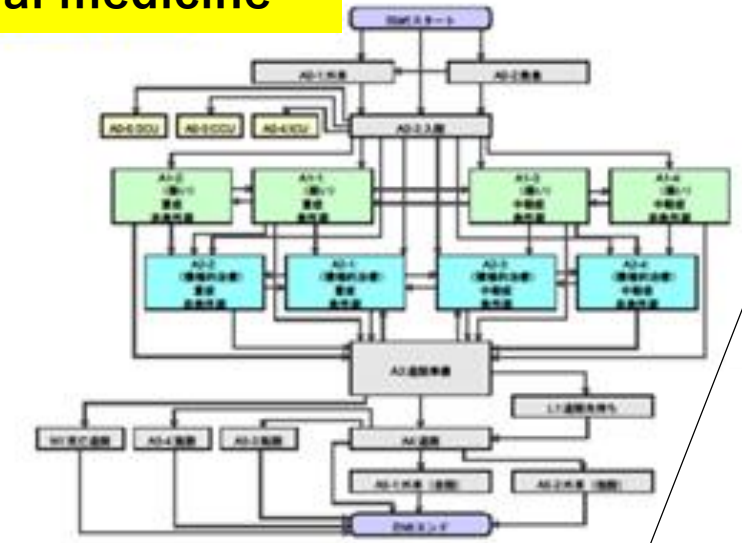
Step 1 : Process Path Design

- **Generalization/Familiarization of PCAPS contents for implementation**

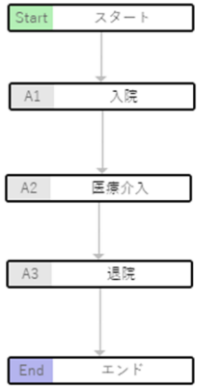
surgery



internal medicine



Short term admission



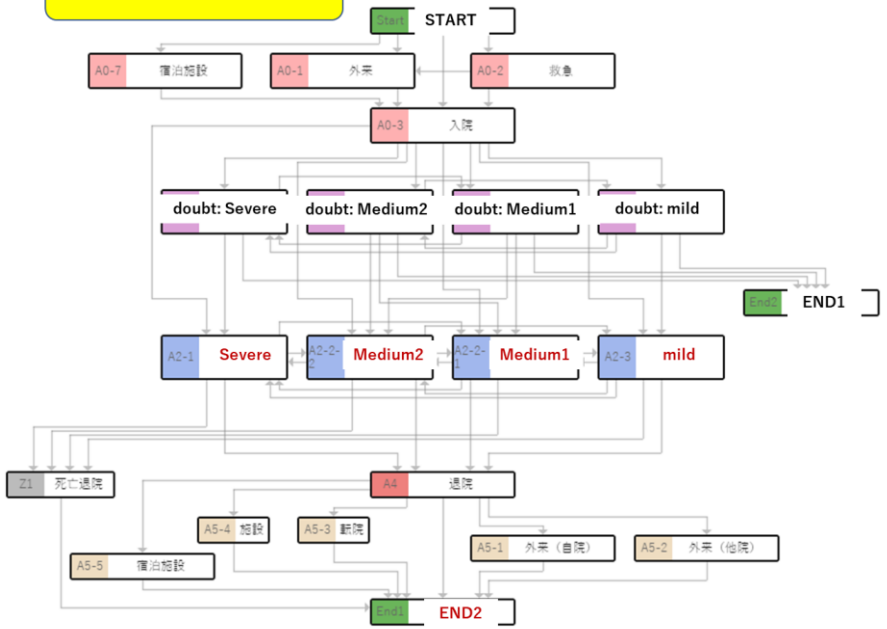
Management for parallel patient condition

Event: Event to inhibit medical treatment

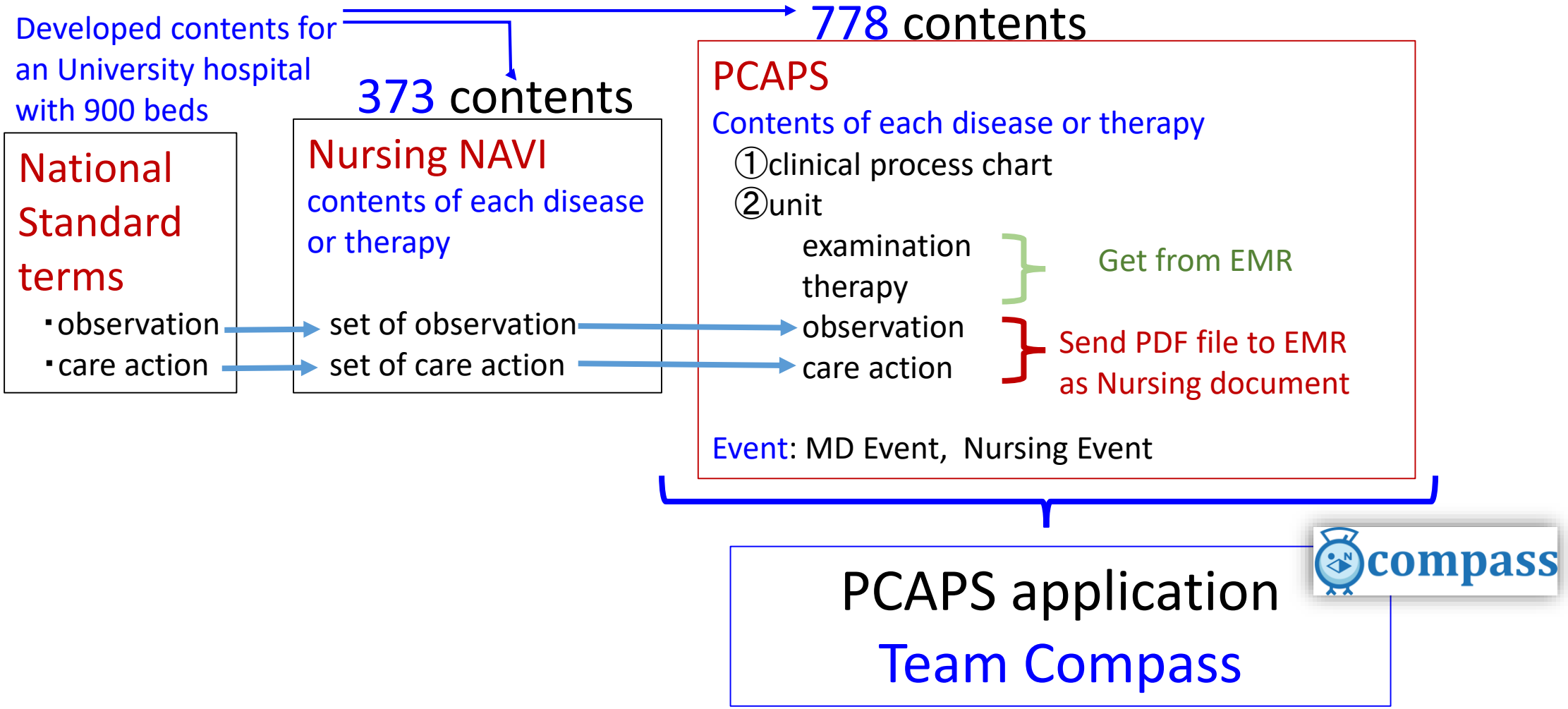
- **Red: Medical Doctor event**
- **Blue: Nursing event**

unique CPC

COVID-19



Step 2 : Development of digital path content



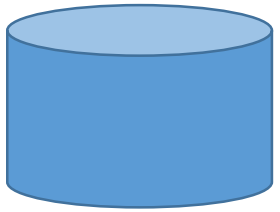
It was started to use the Team Compass connected EMR from May 2019 in Nara medical university hospital with 900 beds.

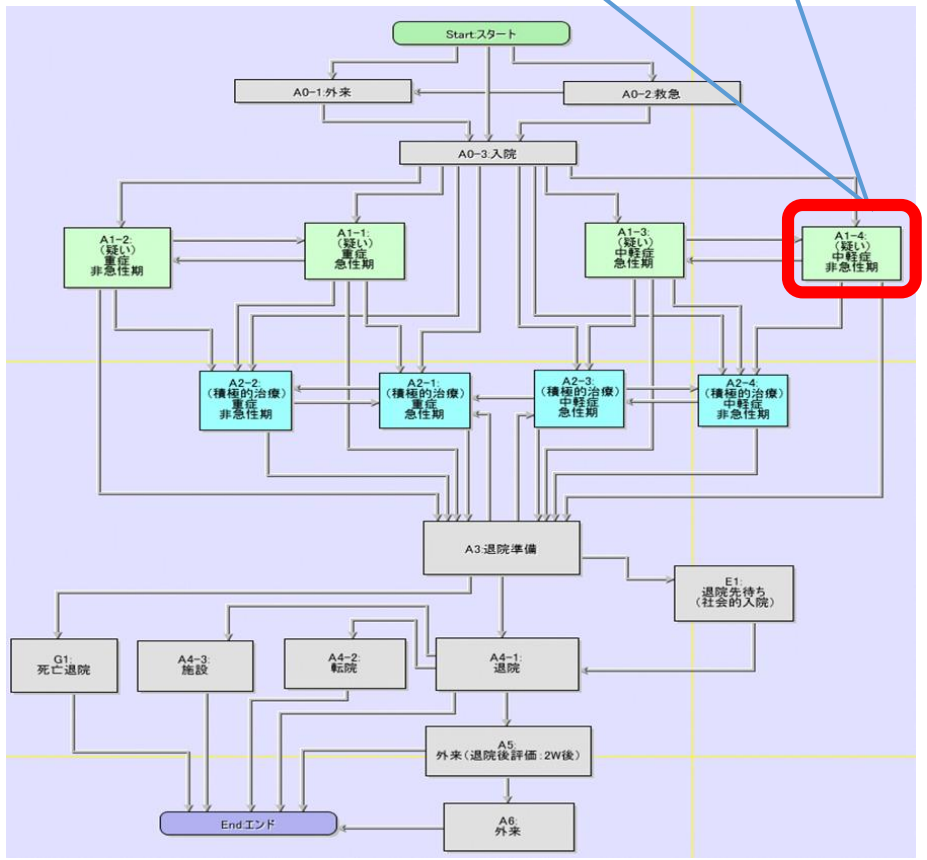
Step 3 : Development of the application system and operation design

Medical doctor adopt each patient to best suited PCAPS content and ordered start unit.

Each unit has observation items designed by nursing experts and medical doctors. A nurse cannot delete the observation items ordered by medical doctors

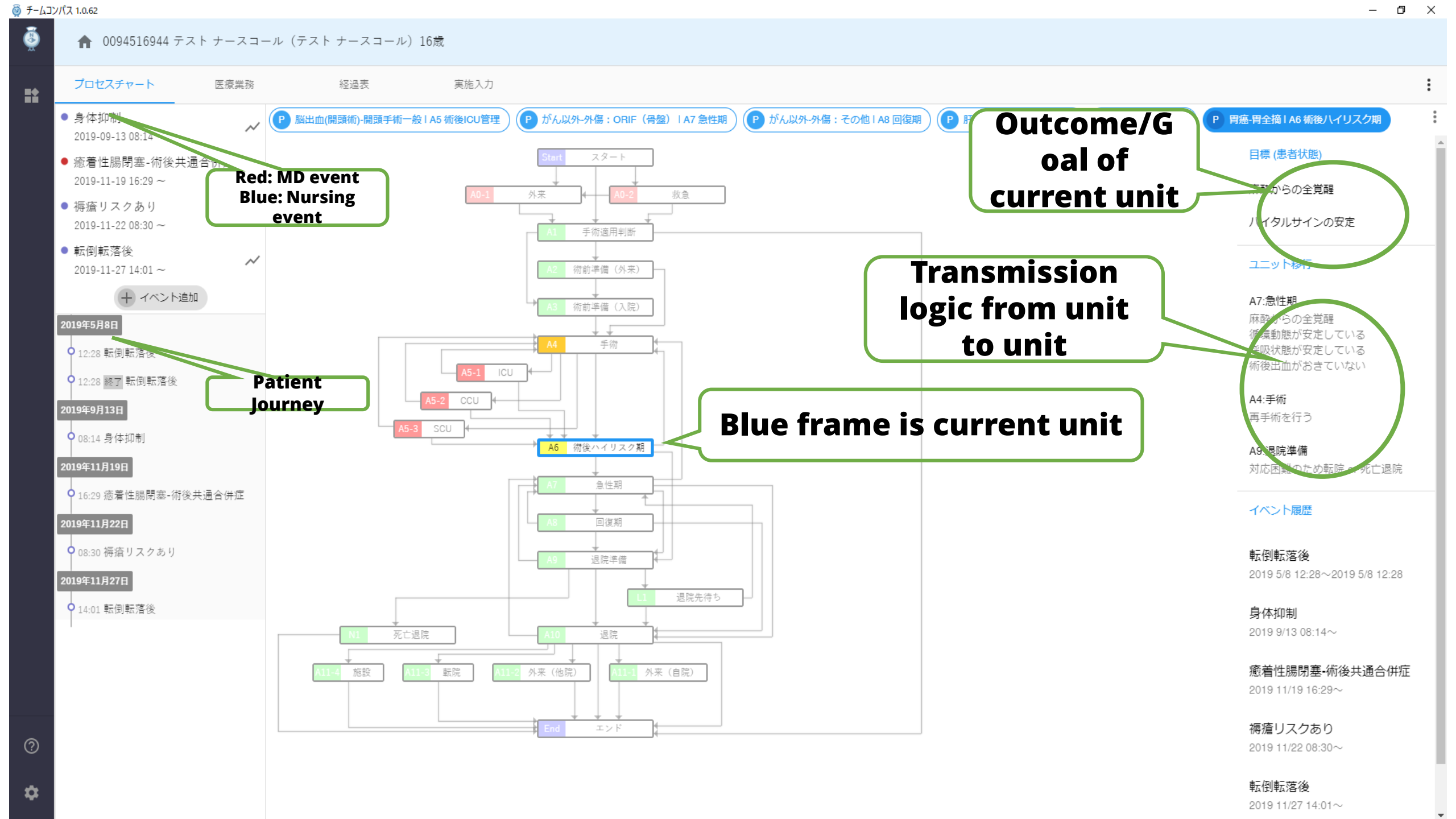
List of PCAPS contents





Clinical process chart

When nurse plan observation and daily care for new inpatient, she/he select observation items for the patient.


チームコンパス 1.0.62
0094516944 テスト ナースコール（テスト ナースコール）16歳
プロセスチャート
医療業務
経過表
実施入力
身体抑制
2019-09-13 08:14
癒着性腸閉塞-術後共通合併
2019-11-19 16:29 ～
褥瘡リスクあり
2019-11-22 08:30 ～
転倒転落後
2019-11-27 14:01 ～
イベント追加
Red: MD event
Blue: Nursing event
Patient Journey
2019年5月8日
12:28 転倒転落後
12:28 終了 転倒転落後
2019年9月13日
08:14 身体抑制
2019年11月19日
16:29 癒着性腸閉塞-術後共通合併症
2019年11月22日
08:30 褥瘡リスクあり
2019年11月27日
14:01 転倒転落後
P 脳出血(開頭術)-開頭手術一般 | A5 術後ICU管理
P がん以外-外傷：ORIF（骨盤） | A7 急性期
P がん以外-外傷：その他 | A8 回復期
P 胃癌-胃全摘 | A6 術後ハイリスク期
Start スタート
A0-1 外来
A0-2 救急
A1 手術適用判断
A2 術前準備（外来）
A3 術前準備（入院）
A4 手術
A5-1 ICU
A5-2 CCU
A5-3 SCU
A6 術後ハイリスク期
A7 急性期
A8 回復期
A9 退院準備
L1 退院先待ち
N1 死亡退院
A10 退院
A11-4 施設
A11-3 転院
A11-2 外来（他院）
A11-1 外来（自院）
End エンド
Outcome/Goal of current unit
Transmission logic from unit to unit
Blue frame is current unit
目標 (患者状態)
からの全覚醒
バイタルサインの安定
ユニット移行
A7:急性期
麻酔からの全覚醒
循環動態が安定している
呼吸状態が安定している
術後出血がおきていない
A4:手術
再手術を行う
A9:退院準備
対応困難のため転院 or 死亡退院
イベント履歴
転倒転落後
2019 5/8 12:28～2019 5/8 12:28
身体抑制
2019 9/13 08:14～
癒着性腸閉塞-術後共通合併症
2019 11/19 16:29～
褥瘡リスクあり
2019 11/22 08:30～
転倒転落後
2019 11/27 14:01～

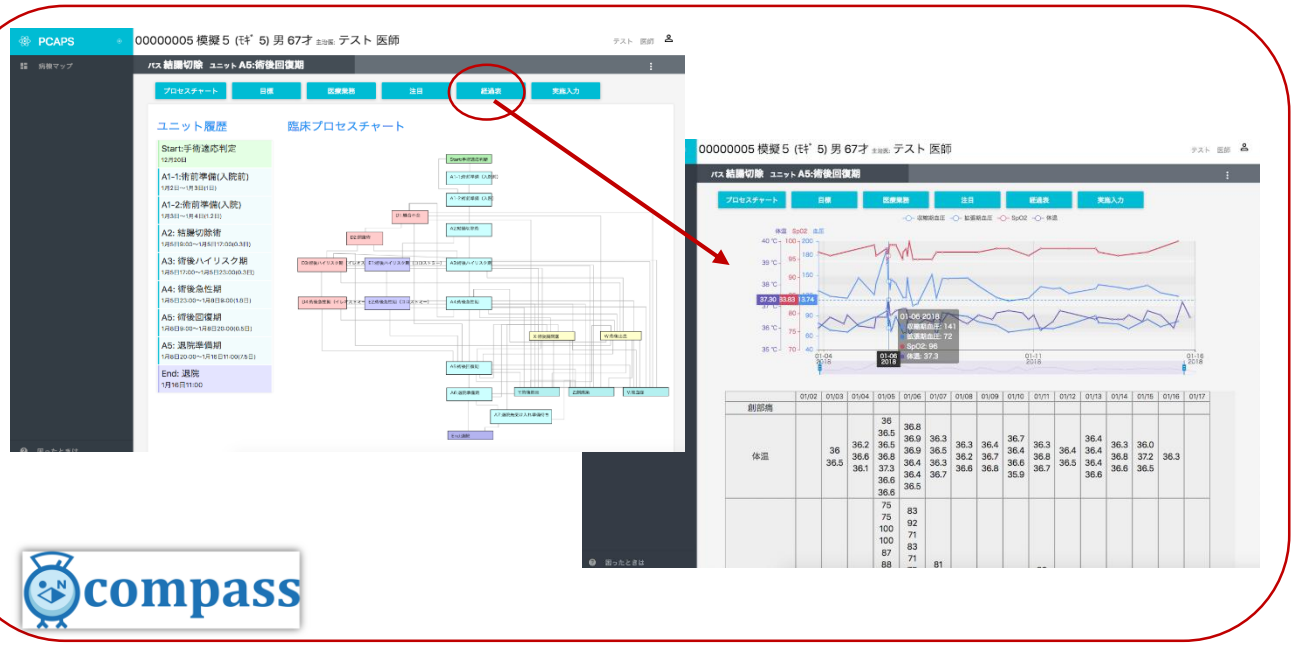
Step 4 : Implementation

In May 2019, a clinical support system linked to the EMRS was implemented in a 900-bed university hospital.

Compass Button

Terminal of EMR

1. A medical doctor order PCAPS content for each patients from EMR
2. A nurse open EMR and select a patient.
3. When a nurse push ‘compass button’, PCAPS start for the patient.
4. A nurse grasp patient’s conditions and start her work.



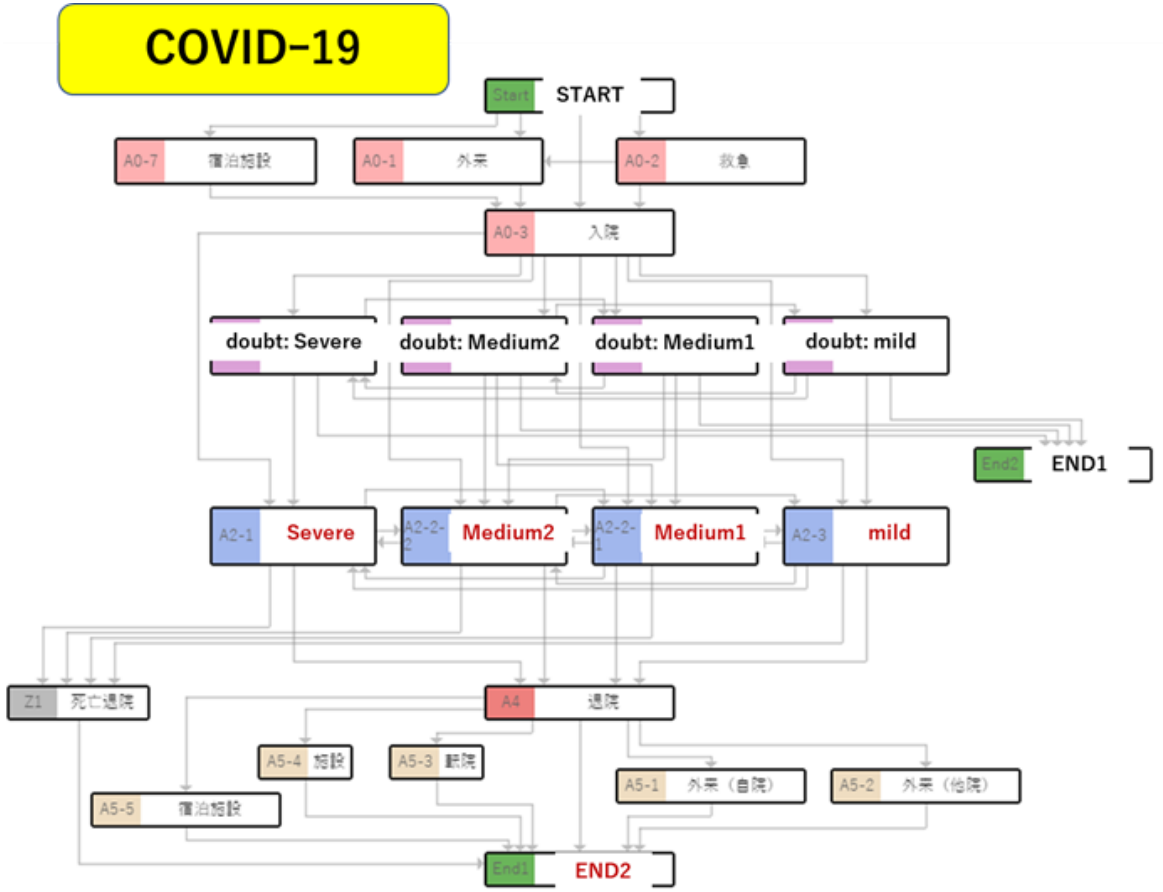
2. Methods

Development of a "COVID-19 clinical management system" (2020)

A COVID-19 clinical management system, consisting of PCAPS contents, monitoring tools, and an operational system, was developed.

(1) PCAPS contents (COVID-19)

The Ministry of Health, Labor and Welfare (MHLW) created the "COVID-19 Clinical Practice Guide for New-type Coronavirus Infections, version 2.2. We developed a process path based on this guide, consisting of 4 units for suspected COVID-19 patients and 4 units for definitively diagnosed COVID-19 patients.



2. Methods Development of a "COVID-19 clinical management system" (2020)

(2) Monitoring tools (a COVID-19 symptom observation tool and a dashboard for all hospitalized patients)

The "COVID-19 Symptom Observation Enhancement Items" were developed. When they were applied to all inpatients, eight observation items were automatically incorporated into the nursing plan and implemented. A dashboard was developed to collect and monitor the entered data.

Management for parallel patient condition

Event: Event to inhibit medical treatment
- Red: Medical Doctor event
- Blue: Nursing event

Nursing event:

intension items for symptoms of COVOD-19 (8 items)

Body temperature (>=37.5℃)
Cough
Sputum
feeling of fatigue
nasal mucus
Abnormity of taste
Throat
Difficulty of smell

2. Methods Development of a "COVID-19 clinical manageme

(3) Operational system

Using the monitoring tools described in (2), nurses in the infection control room narrowed down the list of suspected COVID-19 patients and wards where cluster outbreaks may have occurred and reported the results to a physician in the infection control department.

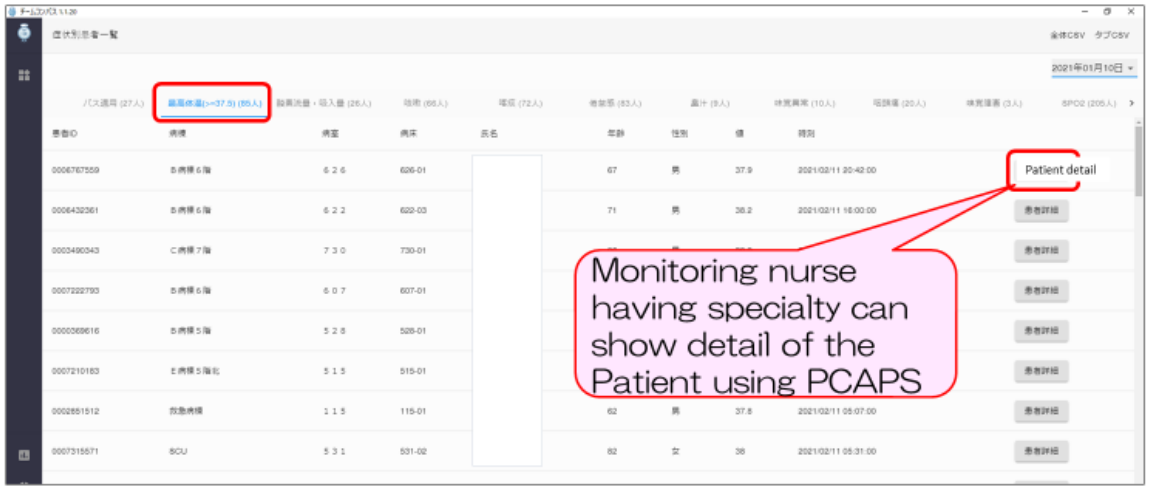
Based on this data, the physician decided whether to move patients to a different ward.

Then, the PCAPS content outlined in (1) was applied, and testing and treatment of suspected and definitively diagnosed COVID-19 patients were initiated. If a suspected COVID-19 patient was PCR-positive, they were transferred from the suspected ward to the COVID-19 ward.

Monitoring tool
(count of patient numbers every symptoms)

15

Monitoring tool
(List of Patients having symptoms of COVID-19)



16

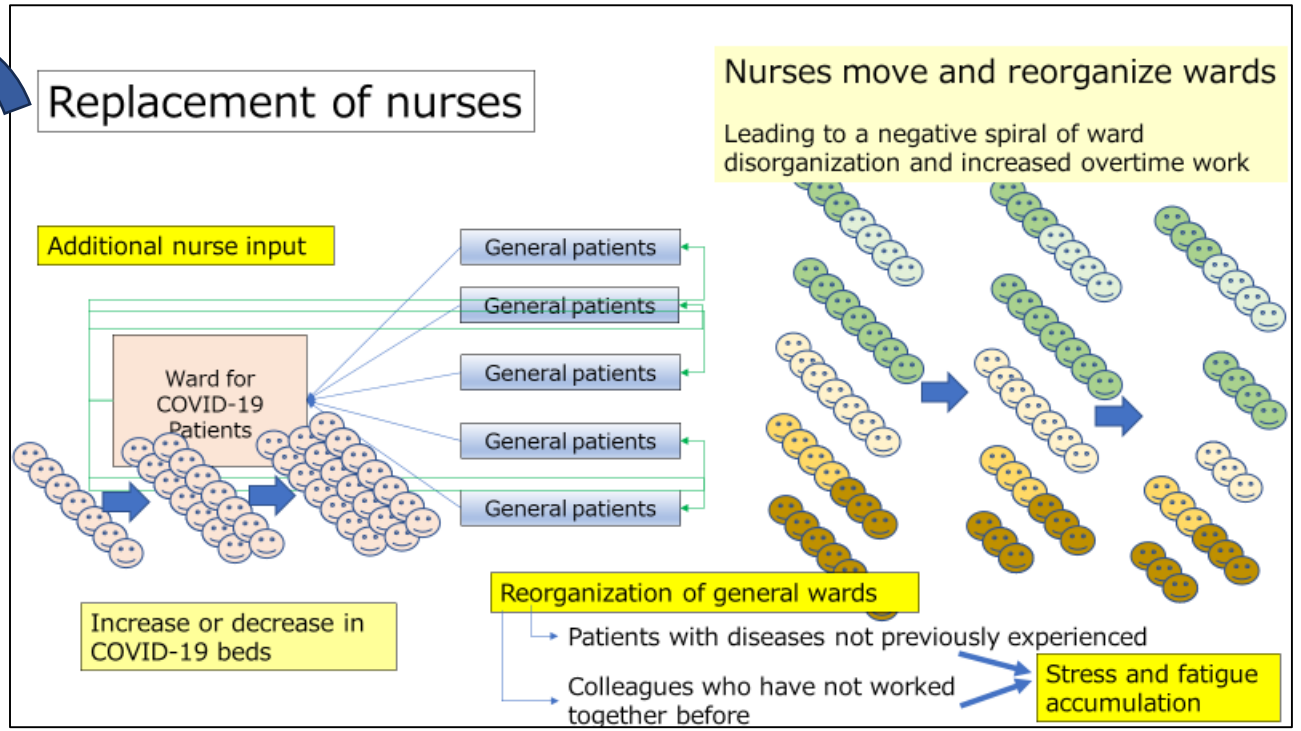
2. Methods

Development of a "COVID-19 clinical management system" (2020)

(3) Operational system

All nursing plans for both wards were standardized based on the PCAPS content (COVID-19). The nurses assigned to both wards rotated at regular intervals, but this did not cause any confusion. As the number of infected patients changed, the numbers of beds allocated to the suspected COVID-19 and COVID-19 wards were also altered, resulting in the repeated reorganization of general wards and the reassignment of nurses.

In hospitals that implemented this system, when nurses were assigned to other wards they were immediately able to provide appropriate clinical care based on each patient's nursing care plan.



- hospital N : 2019 application system, 2020 the CMS for COVID-19
- Hospital T : 2020 application system, 2021 the CMS for COVID-19
- Hospital B : 2022 application system, 2022 the CMS for COVID-19

		Hospital B 477beds, acute & general hospital, Private			Hospital T 400beds, acute & general hospital, Semi-public			Hospital N 900beds, university hospital					
Fiscal Year	COVID-19 outbreaks (wave)	Turnover rate			Turnover rate			Turnover rate			Bed occupancy rate		
		all RN	new RN	O-prefecture	all RN	new RN	T-prefecture	all RN	new RN	N-prefecture			
FY2018		13.0%	7.0%		12.9%	20.0%		8.3%	8.7%		96%	79%	92%
FY2019		**9.0%**	9.0%	13.5%	**10.6%**	18.0%	14.9%	**11.3%**	**1.2%**	11.1%	95%	80%	90%
FY2020	1st W. : small 2nd W.: small 3rd W. : middle	**10.0%**	12.9%	12.3%	**10.1%**	**9.0%**	13.4%	**10.0%**	9.9%	10.8%	92%	69%	77%
FY2021	4th W. : middle 5th W. : middle	**12.0%**	14.2%	14.3%	**11.5%**	18.0%	14.6%	**7.5%**	6.9%	12.3%	93%	65%	68%
FY2022	6th W. : large 7th W. : large	**10.0%**	**10.9%**								94%	53%	57%

5. Conclusion

- The effectiveness of the implementation of the developed systems was analyzed using the nurse turnover rate. We collected and compared relevant data from three hospitals. The results suggest that these systems have the potential to reduce nurse turnover in addition to the previously reported ability of Team Compass with PCAPS to reduce overtime hours.
- In Japan, there is a need to respond to future pandemics and to reform the work styles of physicians and nurses. The abovementioned systematic approach has great potential to contribute to both of these aims.

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