Pioneer Simulation- based Crew Resources Management (CRM) training in Hong Kong: A retrospective study to evaluate the impact of locally adopted simulation based CRM training on patient safety culture among personnel under NTWC

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Background

- Crew Resources Management
  - Promotes safety and team efficiency through optimal use of resources
  - Multidisciplinary learning experience
  - Improve teamwork
  - Enhance patient safety and reduce medical errors

Background

- Commenced in NTWC since 2011

- 1 day course from classroom based to simulation based

Objective

- Investigate the **impact** of locally adopted CRM simulation based training on **perception** and **knowledge** about CRM among general staff and OT staff

Methodology

- Retrospective study to evaluate the impact of CRM training on patient safety culture in general and OT personnel in TMH

- May 2013 to Septe

- Questionnaire
  - 12 item
  - 32 item

- Subgroup analysis

CRM Survey (After CRM workshop)

Survey Target

- NTWC medical, nursing, allied health & administration staff
- On patient care safety
- Before attending the CRM Workshop

Part A-1

Status of Survey Participant

1 Date of last CRM Workshop / CRM Lecture
_____

2 If you cannot provide "Date of last CRM workshop / CRM lecture", please select follow

☐ Within 3 months   ☐ Between 3 to 12 months after the workshop   ☐ More than 12 months after the workshop

Part A-2

Status of Survey Participant

1 Department
_____

2 Grade
☐ Medical   ☐ Nursing   ☐ Allied Health   ☐ Admin   ☐ Others
Remark for Others _____

Part B

Evaluation of the work situation

Strongly Disagree ... Strongly Agree
1 2 3 4 5 6 7 8 9 10

1 Your Unit requires you to complete work tasks in a short amount of time

2 Patient safety is always inversely proportional to work efficiency

3 I would prefer taking short-cuts to complete my work than following the standard procedures

4 You are informed about errors that happen in your unit

5 Staff are afraid to ask questions when something does not seem right

6 Patient safety rules and regulations are presented in a simple & understandable format in your Unit

7 Our Unit ensures that everyone in our Unit clearly understands our goals

Results

- Response rate
  - 45 frontline training workshops with 712 participants
  - 12 item questionnaire
    - 660 (93%) completed
  - 32 item questionnaire
    - General staff
      - 612 (86.0%) completed pre and post-1m survey
      - 146 (20.5%) completed pre, post-1m and post-1yr FU survey
    - OT staff
      - 132/157 (84.1%) completed pre and post-1m survey
      - 32 (20.4%) completed pre, post-1m and post-1yr survey

Description	Strongly agree (%)	Agree (%)	No comment (%)	Disagree (%)	Strongly disagree (%)	Mean
The program has achieved its stated goals.	345 (52.4)	311 (47.3)	2 (0.3)	0 (0)	0 (0)	4.52
The program met my training needs.	330 (50)	323 (48.9)	7 (1.1)	0 (0)	0 (0)	4.49
The program that I learned can be applied to my practice.	331 (50.2)	323 (48.9)	6 (0.9)	0 (0)	0 (0)	4.49
The program is organized.	429 (65.1)	227 (34.4)	3 (0.5)	0 (0)	0 (0)	4.65
Length of the course is appropriate.	247 (37.5)	355 (53.9)	47 (7.1)	9 (1.4)	1 (0.2)	4.27
Trainers are of high standard and expertise.	386 (58.5)	264 (40)	10 (1.5)	0 (0)	0 (0)	4.57
The course materials are well prepared.	401 (60.8)	256 (38.8)	2 (0.3)	1 (0.2)	0 (0)	4.60
Scenarios are realistic.	374 (56.8)	278 (42.2)	6 (0.9)	1 (0.2)	0 (0)	4.56
Scenarios are able to facilitate decision making.	318 (48.3)	328 (49.8)	11 (1.7)	1 (0.2)	0 (0)	4.46
Debriefing session is useful.	368 (55.9)	284 (43.2)	5 (0.8)	1 (0.2)	0 (0)	4.55
Simulation is more powerful than lecture based training for this program.	378 (57.3)	260 (39.4)	18 (2.7)	2 (0.3)	2 (0.3)	4.53
I am overall satisfied with this training program.	392 (59.4)	263 (39.8)	5 (0.8)	0 (0)	0 (0)	4.59

Table 1 Satisfaction score of all participants upon completion of the course

Questions about your unit

General Staff

	Pre > Post-1m n=612	Pre > Post-1yr n=146
B1) Your Unit required you to complete work tasks in a short amount of time	6.52 > 6.74 P=0.003	6.71 > 6.63 P=0.524
B4) You are informed about errors that happen in your unit	6.94 > 7.15 P=0.005	6.94 > 7.23 P=0.071
B5) Staff are afraid to ask questions when something does not seem right	4.58 > 4.50 P=0.479	4.57 > 3.90 P=0.001
B6) Patient safety rules and regulations are presented in a simple & understandable format in your Unit	6.89 > 7.21 P<0.001	6.92 > 7.24 P=0.011
B7) Our Unit ensures that everyone in our Unit clearly understands our goals	6.91 > 7.30 P<0.001	6.93 > 7.25 P=0.024
B9) Our unit deals with personal conflicts in fair and equitable ways	6.68 > 6.85 P=0.008	6.67 > 6.86 P=0.213
B14) Your Unit encourages you to speak up to other staff about work-related problems	6.77 > 7.00 P=0.003	6.74 > 7.14 P=0.006
B15) Clinical Errors are common in your unit	3.73 > 3.84 P=0.068	3.68 > 3.77 P=0.617

Table 2 Questions about your unit from general participants. 1= strongly disagree, 10=strongly agree. P- values obtained from Wilcoxon signed rank test

OT staff

	Pre > Post-1m n=132	Pre > Post-1yr n=32
B1) Your Unit required you to complete work tasks in a short amount of time	6.71 > 6.78 P=0.627	6.72 > 6.75 P=0.976
B4) You are informed about errors that happen in your unit	6.76 > 7.07 P=0.072	6.97 > 7.16 P=0.588
B5) Staff are afraid to ask questions when something does not seem right	4.48 > 4.34 P=0.459	4.22 > 4.38 P=0.713
B6) Patient safety rules and regulations are presented in a simple & understandable format in your Unit	6.48 > 7.08 P=0.001	6.75 > 6.81 P=0.863
B7) Our Unit ensures that everyone in our Unit clearly understands our goals	6.39 > 7.02 P<0.001	6.59 > 7.03 P=0.124
B9) Our unit deals with personal conflicts in fair and equitable ways	6.17 > 6.55 P=0.008	6.22 > 6.19 P=1.000
B14) Your Unit encourages you to speak up to other staff about work-related problems	6.29 > 6.86 P=0.001	6.28 > 6.63 P=0.341
B15) Clinical Errors are common in your unit	4.12 > 4.27 P=0.274	4.19 > 4.72 P=0.066

Table 3 Questions about your unit from OT participants. 1= strongly disagree, 10=strongly agree. P- values obtained from Wilcoxon signed rank test

Evaluation of CRM Knowledge

	Pre > Post-1m	Pre > Post-1yr
	n=612	n=146
C1) Concerning CRM, which combination best describes its major principles? Ans.: Patient safety; High reliability.	50.2 > 71.7 P<0.001	51.4 > 74.7 P<0.001
C2) In your Hospital as a whole, which of the following is least correct? Ans.: Clinical errors are often mild & tend not to affect patients' outcome.	28.8 > 34.6 P=0.012	30.1 > 29.5 P=1.000
C3) In Team Briefings, which combination best describes its major functions? Ans.: All except "Review errors".	18.0 > 56.5 P<0.001	19.9 > 39.0 P<0.001
C4) In Team Debriefings, which is the most correct option? Ans.: Use "what & how instead of who" to facilitate evaluation & to search for solution.	74.7 > 79.6 P=0.017	78.1 > 84.2 P=0.200
C5) Which of the following is least related to Situational Awareness? Ans.: Your Team Leader talks about the past experience.	40.5 > 61.6 P<0.001	46.6 > 61.0 P=0.015
C6) Your new senior specialist requests you to give IV amiodarone 300mg instead of the recommended 150mg in ad adult with stable VT (ventricular tachy). Your action will be:- Ans.: Show your concern or worry and check the dose with the senior again by assertion.	85.3 > 91.7 P<0.001	90.4 > 89.7 P=1.000
C7) In Effective Teamwork, which combination best describes its advantages or functions? Ans.: Members with a common goal; Can more efficiently overcome complex & dynamic patient condition; Cooperative division of duties can enhance power to manage external pressures; Back-up compensation by teammates.	32.7 > 44.1 P<0.001	37.7 > 46.6 P=0.130
C8) Which of the followings best indicates the desirable traits of a Clinical Team Leader? Ans.: Team leadership in health care is an individual's ability to inspire confidence and influence people to act in a well-coordinated manner with a shared focus on safe, reliable care.	43.8 > 55.4 P<0.001	41.8 > 45.2 P=0.615
C9) In conflict management, which are the useful strategies? Ans.: Negotiation, mediation & diplomacy; Mutual respect; Concern of the others' feelings; Good listening; Manage stress while remaining alert and calm; Control your emotions and behavior.	54.2 > 61.9 P=0.001	60.3 > 66.4 P=0.233
C10) A m/80 patient develops acute SOB (shortness of breath). What is the most effective communication sequence to your senior on this	78.6 > 94.8 P<0.001	80.1 > 90.4 P=0.004
CRM Knowledge (Total score for C1-C10)	5.07 > 6.52 P<0.001	5.36 > 6.27 P<0.001

McNemar's test and Wilcoxon signed rank test

	Pre > Post-1m	Pre > Post-1yr
	n=132	n=32
C1) Concerning CRM, which combination best describes its major principles? Ans.: Patient safety; High reliability.	48.5 > 72.0 P<0.001	46.9 > 78.1 P=0.006
C2) In your Hospital as a whole, which of the following is least correct? Ans.: Clinical errors are often mild & tend not to affect patients' outcome.	33.3 > 34.1 P=1.000	31.3 > 37.5 P=0.727
C3) In Team Briefings, which combination best describes its major functions? Ans.: All except "Review errors".	24.2 > 55.3 P<0.001	31.3 > 31.3 P=1.000
C4) In Team Debriefings, which is the most correct option? Ans.: Use "what & how instead of who" to facilitate evaluation & to search for solution.	75.8 > 83.3 P=0.076	81.3 > 81.3 P=1.000
C5) Which of the following is least related to Situational Awareness? Ans.: Your Team Leader talks about the past experience.	50.0 > 68.2 P=0.001	43.8 > 56.3 P=0.388
C6) Your new senior specialist requests you to give IV amiodarone 300mg instead of the recommended 150mg in ad adult with stable VT (ventricular tachy). Your action will be:- Ans.: Show your concern or worry and check the dose with the senior again by assertion.	89.4 > 91.7 P=0.648	93.8 > 84.4 P=0.375
C7) In Effective Teamwork, which combination best describes its advantages or functions? Ans.: Members with a common goal; Can more efficiently overcome complex & dynamic patient condition; Cooperative division of duties can enhance power to manage external pressures; Back-up compensation by teammates.	35.6 > 45.5 P=0.098	37.5 > 40.6 P=1.000
C8) Which of the followings best indicates the desirable traits of a Clinical Team Leader? Ans.: Team leadership in health care is an individual's ability to inspire confidence and influence people to act in a well-coordinated manner with a shared focus on safe, reliable care.	43.9 > 57.6 P=0.010	34.4 > 31.3 P=1.000
C9) In conflict management, which are the useful strategies? Ans.: Negotiation, mediation & diplomacy; Mutual respect; Concern of the others' feelings; Good listening; Manage stress while remaining alert and calm; Control your emotions and behavior.	60.6 > 64.4 P=0.560	65.6 > 68.8 P=1.000
C10) A m/80 patient develops acute SOB (shortness of breath). What is the most effective communication sequence to your senior on this patient?	78.0 > 96.2 P<0.001	71.9 > 93.8 P=0.016
CRM Knowledge (Total score for C1-C10)	5.39 > 6.68 P<0.001	5.38 > 6.03 P=0.024

McNemar's test and Wilcoxon signed rank test

Evaluation of Competence

General Staff

	Pre > Post-1m	Pre > Post-1yr
	n=612	n=146
D1) Competence as a Clinical Team Member	6.71 > 8.04 P<0.001	6.99 > 7.60 P<0.001
D2) Competence as a Clinical Team Leader	5.89 > 7.57 P<0.001	6.23 > 7.4? P<0.001
D3) Chance to apply CRM or similar concept in your daily work	6.33 > 8.03 P<0.001	6.45 > 7.61 P<0.001

Table 6 Evaluation of CRM knowledge from general participants. 1= strongly disagree, 10=strongly agree. P- values obtained from Wilcoxon signed rank test

OT staff

	Pre > Post-1m	Pre > Post-1yr
	n=132	n=32
D1) Competence as a Clinical Team Member	5.99 > 7.73 P<0.001	6.16 > 7.72 P=0.002
D2) Competence as a Clinical Team Leader	5.05 > 7.11 P<0.001	5.31 > 7.16 P<0.001
D3) Chance to apply CRM or similar concept in your daily work	5.72 > 7.81 P<0.001	5.94 > 7.78 P<0.001

Table 7 Evaluation of CRM knowledge from OT participants. 1= strongly disagree, 10=strongly agree. P- values obtained from Wilcoxon signed rank test

Evidence on Reaction & Learning

- CRM training is associated with improvement in attitude towards patient safety

- However only reflects Kirkpatrick model level 1 (reaction) and 2 (learning)

Kirkpatrick's model
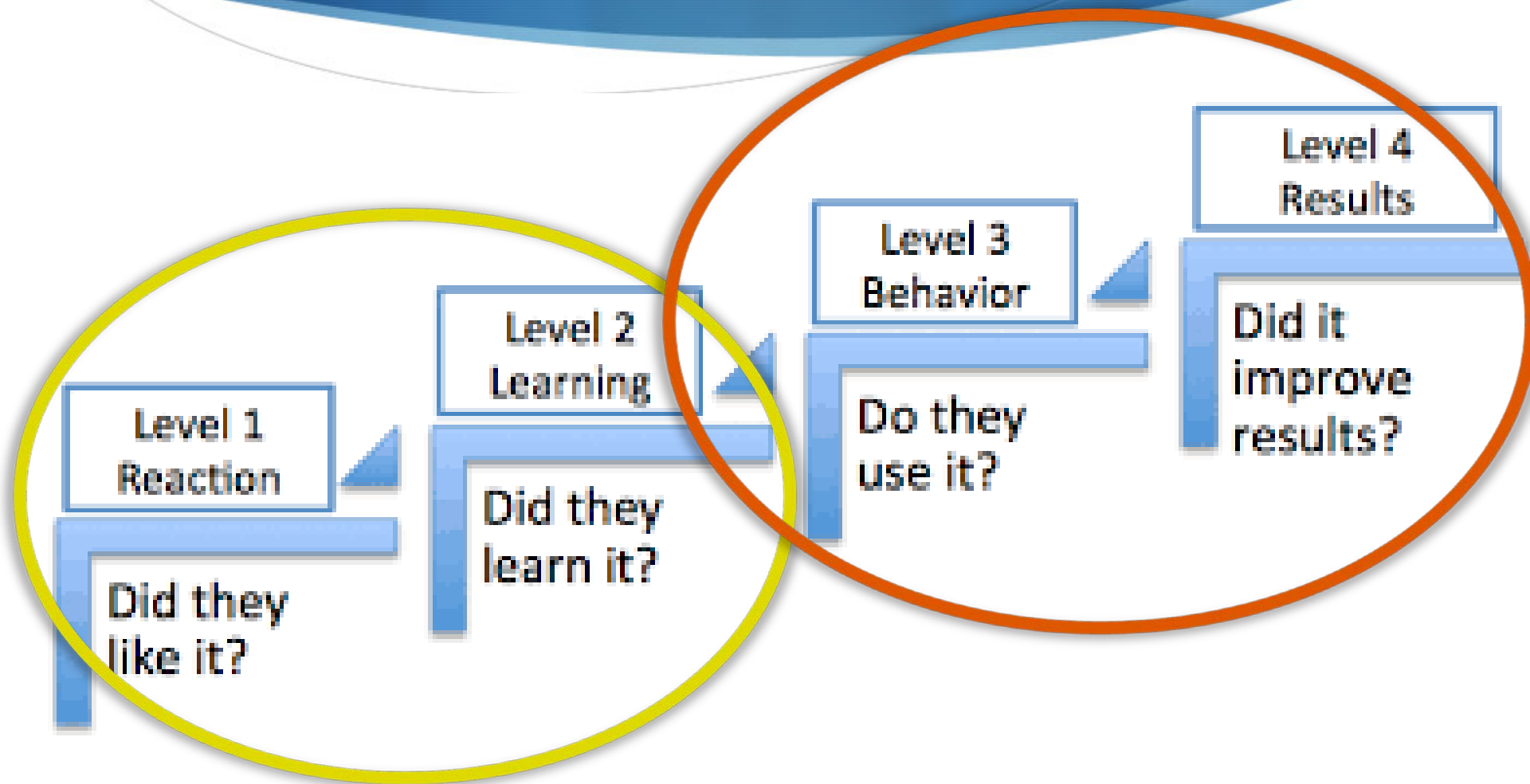
Evidence on Behavior

- Introduction of **CRM elements** into the **workplace**
  - Initiation of *briefing* and *debriefing* huddles for elective list
  - *Mandatory CRM workshops* for all new staff
  - Procedural *Time Out*
  - Use of *critical language* e.g. CUS model
  - Post resuscitation debriefing

Evidence based on NTWC Experience

- Outcome Evidence
  - Briefings and Debriefings in OT
    - Implemented in 5/2014 to elective lists
    - Evaluation
      - *Elective Overrun* (1-year data pre and post initiation)
      - *Start-time Delay* **for 1st Elective Case**
      - *Same-day Elective Cancellation* due to un-optimized patient's status

Checklists, briefings and debriefings
An evidence summary

Reducing perioperative harm

newzealand.govt.nz   www.open.hqsc.govt.nz

Outcome Evidence

 Elective Overrun
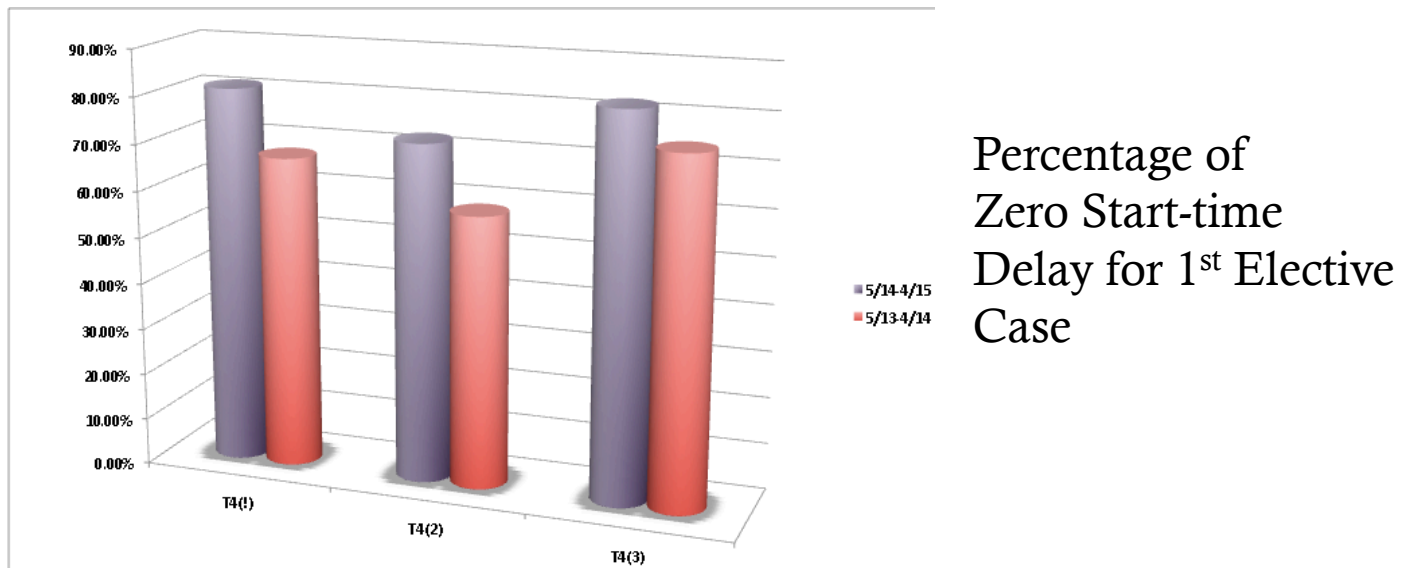

OTMS Late Finish: No of Days with Late Finish

 25-30% reduction in late finish on T4 since the initiation of briefings (c.f. more or less the same on T2/T3/T5)

 Possibly related to more **effective list management**

Outcome Evidence

● *Start-time Delay for 1ˢᵗ Elective Case*

Percentage of Zero Start-time Delay for 1ˢᵗ Elective Case

- 5/14-4/15
- 5/13-4/14

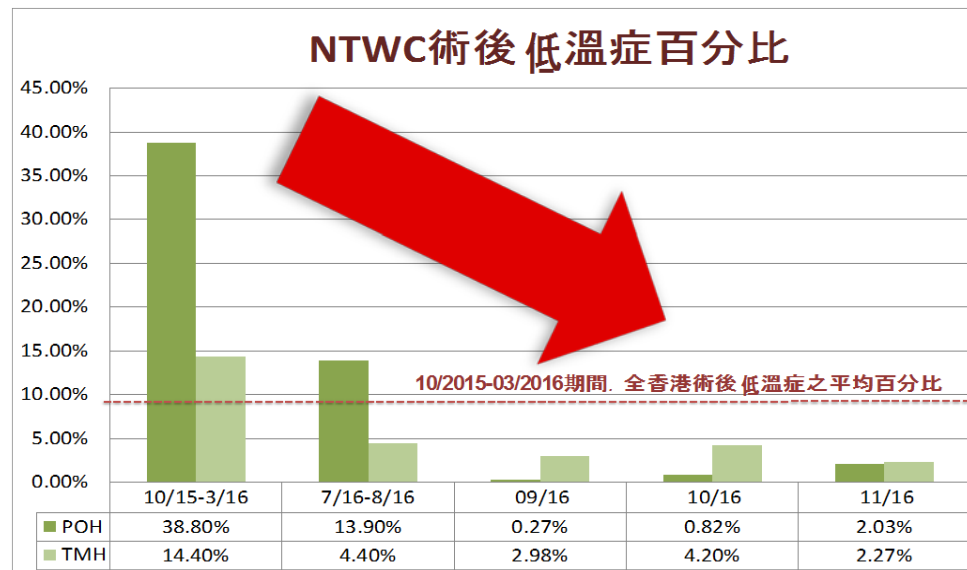● Mean: **66.7% vs. 78.7%** (pre- vs. post-briefing initiation)
● **Better teamwork** and **sharing of common goals**

Outcome Evidence

- ***Same-day Elective Cancellation due to un-optimized patient's status***

  - CDARS reports for reasons of same day elective cancellation

  - Before → 15% same day elective operations had a reason stating that *"patient's not fit for OT'"*

  - After (1/5/2014-30/4/2015)→ **ONE** elective cancellation due to poor chest condition

  - Discussion of concerns about patients' status during briefing huddles allows early recognition of patients requiring further optimization, and therefore <u>prevents unexpected same day elective cancellation</u>

Outcome Evidence

- ***Hypothermia***

NTWC術後低溫症百分比

	10/15-3/16	7/16-8/16	09/16	10/16	11/16
POH	38.80%	13.90%	0.27%	0.82%	2.03%
TMH	14.40%	4.40%	2.98%	4.20%	2.27%

10/2015-03/2016期間, 全香港術後低溫症之平均百分比

» Sharing of common goals of patient safety
» Evidence of built up culture

In summary..

- CRM training is associated with improvement in attitude towards patient safety and ultimately outcome

- Future developments
  - Expansion of briefing and debriefing huddles for all elective lists
  - Tailor made courses for different working environments
  - Further studies to assess CRM within OT and other departments

Reference

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Thank you

Discussion

- General vs OT staff
  - More dramatic changes among general participants
    - Positive attitude changes towards perception of their unit
    - CRM knowledge improvement
  - Possible reasons
    - Better baseline CRM knowledge in OT staff→ diluted effect of CRM
    - Non specific to OT setting scenario
    - Lower number of OT staff involved (n=32)→ false negative
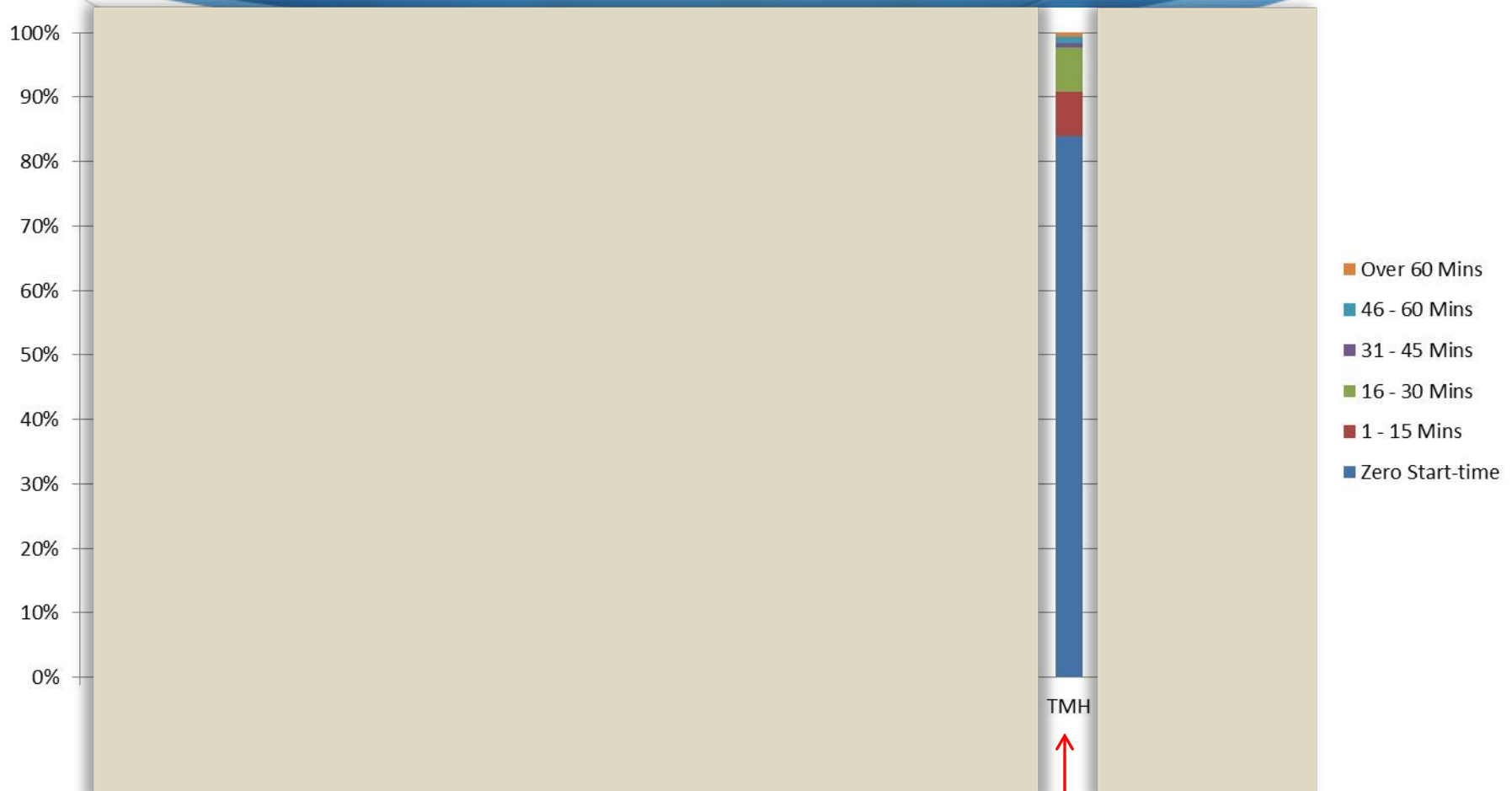
Discussion

- For both general and OT staff
  - Decline in effects of CRM training 1 year after
  - With time they return to usual mode of behavior/ attitude

Discussion

- Limitations of our study
  - Low response rate at 1 year
  - No control group
  - Only assess reaction, changes in perception and knowledge

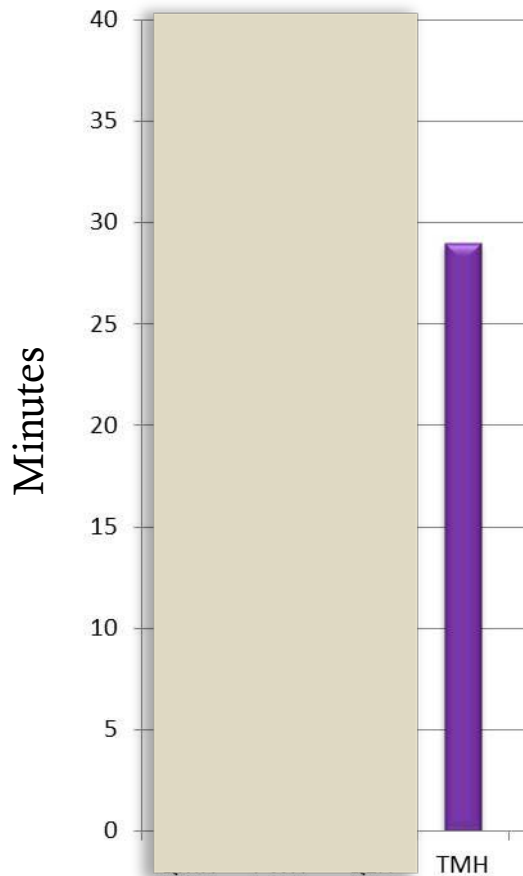# 1. Start-time for 1st Elective Case in 2017Q4 (SUR)

2. Average Anaesthesia Control Time in 2017Q4 (SUR)

Remarks:
TWH : No records with OT cases with anaesthesia control time
Anaesthesia Code with GA, SA, EA, PA, RA, GRA, MAC, CSE, COH were included

3. Average Turn-around Time for Elective Surgery in 2017Q4 (SUR)