

Under the chest pain center mechanism, whether the nursing handover affects the nursing efficiency and the outcomes of patients with STEMI in the emergency department? A retrospective study

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Abstract

Background:

The period of nursing handover is still considered the high incidence period of adverse events because of distractibility of nurses' attention, potential interruption, and unclear responsibilities, although the introduction of chest pain centers (CPC) in China has achieved great success in shortening the duration of nursing operations to significantly improve the treatment and outcomes of patients with ST-segment elevation myocardial infarction (STEMI). However, under the CPC mechanism, the nursing efficiency and patients' outcome whether affected by the nursing handover is still a knowledge gap in research. This is also the aim of this study.

Methods:

This retrospective study was conducted with data of STEMI patients from a tertiary hospital in the north of Sichuan Province in the Chinese Mainland from January 2018 to December 2019 through the Chinese CPC database. This hospital is also the largest chest pain center in the region which has 1,200 beds, including 80 emergency beds, and treats over 10,000 emergency patients annually. Then divided data into two groups based on patients' arrival times. According to the nursing handover schedule of the participating emergency department, patients with STEMI who visited Emergency Department (ED) during the nursing handover were selected in the handover period group (n = 40), and STEMI patients in other periods were included in the non-handover period group (n = 191). Then items were selected for comparison according to relative studies and guidelines.

Results:

A total of 231 cases were enrolled, of which 40 cases (17.3%) were divided into the handover period group and 191 cases (82.6%) belonged to the non-handover period group. The results showed that the handover period group took significantly longer on items including FMC2BS ($P < 0.001$), BS2CBR ($P = 0.004$), CBR2FAD ($P < 0.001$), and D2W ($P = 0.001$) compared to the non-handover group, but there were no significant differences in D2FMC and FMC2FE as well as the outcomes of patients.

Conclusion:

Compared with the non-handover group, the handover group showed a significant delay in important nursing operations in the emergency department. Hospitals should reform relevant regulations for the nursing handover of CPCs to improve the nursing efficiency of patients with STEMI, ensuring better functioning of CPCs.

Background

As a time-sensitive and fatal disease, the incidence rate of ST-segment elevation myocardial infarction (STEMI) in Europe is 43–144 cases per 100000 people per year, while the in-hospital mortality of STEMI patients in the member countries of the European Society of Cardiology is 4%-12% (Ibanez et al., 2018), which has already brought a heavy burden to society. Studies have shown that the earlier the reperfusion of myocardial ischemia, the better the prognosis of patients (Dingcheng & Shaodong, 2017; Ibanez et al., 2018; Zalenski & Grzybowski, 2001; Zhao et al., 2020), for this purpose, China started to build up Chest Pain Center(CPC) from 2002 (Dingcheng & Shaodong, 2017), consisting of several departments. As the department for diagnosis, early treatment, and preoperative preparation, the treatment and nursing care of the ED is regarded as a vital part of the whole treatment.

Nursing handover has always been regarded as an important part of nursing work, which can transfer the patient's information and ensure the continuity of the patient's treatment plan (Pun, 2021) but also prone to adverse events (Alsolamy et al., 2018). Since numerous studies have proved that the quality of handover is closely related to care quality and patient safety (Anderson et al., 2015), a series of relevant mechanisms have been recommended by experts to assure the quality of handover (Alzahrani et al., 2019; joint commission, 2009). However, Tortosa-Altred et al. (2021) indicated that the actual situation of the emergency department is different from that of many theories, and it is even harmful to blindly follow the recommendations of experts. Although studies show that the introduction of the CPC mechanism has made great progress in the treatment of patients with STEMI in China (Dingcheng & Shaodong, 2017; Fan et al., 2019; Xiang et al., 2020; Zhao et al., 2020), under the CPC mechanism, whether the nursing efficiency and outcomes for patients with STEMI who visited the ED during the nursing handover are affected is still a problem worth studying, while no relevant studies were found in the literature review. As CPC mechanism set many time limits for nursing operations of patients with STEMI and requires the time data should be uploaded to the national database of chest pain centers in time (Zhao et al., 2020) which provides a data basis for this study (Zhao et al., 2020). The objectives of this study were to explore under the CPC mechanism, whether the nursing handover affects the nursing efficiency and the outcomes of patients with STEMI in the emergency department.

Methods

Setting and population:

The study was conducted in a tertiary hospital in mainland China, which is also the largest chest pain center in northern Sichuan, with 1,200 beds, including 80 emergency beds, and treating over 10,000 emergency patients annually. The study was conducted under the Sex and Gender Equity in Research (SAGER) guidelines and retrospective data approved by the Ethics Committee of Guangyuan Central Hospital, and the requirement for informed consent was waived.

To avoid potential bias caused by the covid-19 epidemic, the authors extracted data of patients with STEMI in a tertiary hospital from January 2018 to December 2019 through the national database of chest pain centers. Then divided data into two groups based on patients' arrival times. According to the nursing handover management of the participating emergency department, patients with STEMI who visit ED during nursing handover (7:30 – 8:15; 15: 30 – 16:15; 17: 30 – 18:15; 23:30 – 0:15) were selected for the handover period group (n = 40), STEMI patients in other periods were included in the non-handover period group (n = 191).

Measurements

Items of measurement were selected based on relative official studies and guidelines (“2020 Expert Consensus on the Prevention and Treatment of Heart Failure after Myocardial Infarction,” 2021; Fan et al., 2019; Zalenski & Grzybowski, 2001), 5 of which are directly related to nursing work, D2W refers to the time from arrival at the hospital gate in patients with acute myocardial infarction to the opening of their occluded coronary arteries, is also deeply influenced by nursing work, and closely related to the prognosis of patients.

Data analysis

Normality testing and following t-tests of the data were performed by SPSS (version 24.0, IBM Corporation). Significance was assumed at $P < 0.05$.

Results

A total of 231 cases were enrolled, of which 40 cases (17.3%) were divided into the handover period group and 191 cases (82.6%) belonged to the non-handover period group. The subsequent t-test results are shown in Table 1.

The results showed that the handover period group took significantly longer on items such as FMC2BS ($P < 0.001$), BS2CBR ($P = 0.004$), CBR2FAD ($P < 0.001$), and D2W ($P = 0.001$) compared to the non-handover group, but there were no significant differences in D2FMC and FMC2FE as well as the outcomes.

Table 1
the baseline characteristics and the results of the t-test

	Handover period group	Non-handover period group	P-value
Baseline characteristics			
Cases	40(17.3%)	191(82.6%)	
Gender	40	191	0.676
Male	30	137	
Female	10	54	
Age	62.4	62.8	0.358
BMI	28.92	28.75	0.684
Current smoking	20	104	0.610
Dyslipidemia	30	155	0.378
Diabetes mellitus	18	58	0.096
Heart failure history	7	26	0.525
Renal failure history	4	23	0.716
Previous myocardial infarction	5	16	0.412
Killip class(arrival)			0.781
I	27	115	
II	6	59	
III	5	12	
IV	2	5	
Nursing efficiency			
D2FMC	2.92(minutes)	2.85(minutes)	0.589
FMC2FE	2.12(minutes)	2.14(minutes)	0.876
FMC2BS	9.92(minutes)	7.84(minutes)	0.000**
BS2CBR	13.3(minutes)	12.91(minutes)	0.004*
CBR2FAD	2.32(minutes)	1.31(minutes)	0.000**
D2W	70.6 (minutes)	69.21(minutes)	0.001*

FMC2BS: Time from the first medical contact to the blood sampling BS2CBR: Time from the blood sampling to the cardiac biomarkers report

	Handover period group	Non-handover period group	P-value
Outcomes			
Occurrence of major adverse cardiovascular events	6	29	0.977
Highest troponin values within 72 hours of hospitalization(TNT, ng/L)	2542	2252.4	0.486
Hospitalization	13.8(days)	13.39(days)	0.337
Note: *p < 0.05; **p < 0.001			
D2FMC: Time from the patient's arrival at the hospital gate to the first medical contact FMC2FE: Time from the patient's arrival at the hospital gate to the first medical contact			
FMC2BS: Time from the first medical contact to the blood sampling BS2CBR: Time from the blood sampling to the cardiac biomarkers report			

CBR2FAD: Time from the cardiac biomarkers report to the first antiplatelet drug D2W: Time from the patient's arrival at the hospital gate to the opening of his/her occluded coronary arteries

Discussion

The care of STEMI patients has progressed substantially since CPC construction was popularized nationally (Fan et al., 2019), but there is a lack of focus on the possible reduction in efficiency of care during nursing handover. Although the results showed that the time spent on all items was within the recommended range of CPC guidelines, compared with the non-handover period group, the handover period group showed a significant delay in important nursing operations, which eventually contribute to the delay of D2W. For STEMI patients, this may lead to more serious myocardial damage(Ibanez et al., 2018; Menozzi, 2018).

The management of nursing handover is considered to be the primary factor causing this result. As a multi-disciplinary department, the ED is faced with more emergencies and more critical patients than other departments. However, in China, many EDs have the same nursing handover regulation as other departments, during the handover period, only a small number of nurses will stay at the nurse station, and other nurses have to inspect the whole department and pay attention to hand over a large number of first-aid equipment, drugs, and even environmental sanitation, as well as bedside handover of existing patients, which may cost lots of time and energy (Kumar et al., 2016). Perhaps this can well explain why there is no significant difference between the two groups in D2FMC and FMC2FE. When the patient comes to the emergency department, the nurses who stay in the nursing station immediately make a primary triage of the patient and fetch a doctor then nurses will do the ECG for the patient before the doctor arrives as they have been taught by CPC guidelines (Zhao et al., 2020). But, after the doctor diagnoses that the patient has potential STEMI through ECG (Gulati et al., 2021), there is a significant

difference in the time of further treatment. During the non-nursing handover period, sufficient human resources can enable nurses to carry out multiple operations at the same time, and can even ask colleagues for help when the operation meets some troubles (such as blood collection, IV). By contrast, during the period of nursing handover, fewer human resources with distract attention will make those normal actions precious. Additionally, a national survey indicates in China, there is a huge difference in nursing human resources between day and night in general hospitals. The average nurse-patient ratio is 1:8 during the day, while it can reach 1:23 at night (Shen et al., 2020), which will undoubtedly worsen the situation of nursing handover at night. In addition, the emergency department is a department with a high incidence of nursing interruption. In a Chinese study, 2333 interruptions were observed in 25965 minutes of work in the emergency department, and most of them had negative consequences (Lin et al., 2021) when a nursing interruption occurs during the nursing handover, it may make the situation exacerbated.

Ambiguous responsibility could be another reason for this result. Nursing handover is defined as the handover of nursing responsibilities (Kim & Seomun, 2020). In this period, after 8 hours of shift, outgoing nurses may reluctant to take the responsibilities of patients who visit during the handover, while incoming nurses are still in handover and have not officially started work. This may cause more nurses present in ED during the handover than the rest of the time, but fewer nurses participate in the treatment. At this point, both the smooth triage of patients in the triage (to determine the responsibility) and the good relationship between the transfer in and out of the nurse can improve the quality of handover, ensure the efficiency of nursing care, and reduce the occurrence of adverse events (Thomson et al., 2018).

In addition, the nurses' behavior followed the doctors' orders, but in most hospitals, the doctors' handover time was similar to or overlapped with that of the nurses. This leads to the fact that during handover, doctors also face the problem of fewer human resources and distract attention, when faced with difficult cases, the lack of help from experienced colleagues makes the time of diagnosis and prescribing prolonged, which could also delay the nurses' operations.

Although this study found that under the CPC mechanism nursing handover would still prolong the D2W for patients, there was no significant difference in patient outcomes between the two groups. This may result from several reasons. Firstly, the time between symptom onset and arrival at the ED in patients with STEMI may influence patient outcomes. Patients may not be present in time because of less severe symptoms, inconvenient visits, or lack of relevant medical knowledge, and these delays may be longer than the d2w delay caused by nursing handover. Secondly, patients' status of emotions and nutrition, and different adherence to medical treatment during hospitalization could also affect the outcomes of treatment. Thirdly, it is possible that the sample size of the study was not large enough to detect relevant issues.

Limitations

Firstly, the sample size was not large enough, this CPC was established in 2018 with few patients in the beginning, and to avoid the interference of the Covid-19 pandemic, only cases from January 2018 to

December 2019 were extracted. Secondly, as all data come from the same CPC, conclusions should be drawn with caution when generalizing and applying.

Conclusion

Although the findings indicate that during handover the nursing efficiency still meets the requirements of the CPC guidelines, the handover group experienced a significant delay in nursing operations compared with the non-handover group, which contributed to the delay of the D2W which could lead to a worse prognosis for STEMI patients. Hospitals should also reform relevant regulations after constructing CPCs to create more suitable conditions to improve nursing efficiency and assure that CPCs could play a better role. This study did not find a significant difference in the outcomes between the two groups, and the quality of life after discharge between the two groups warrants further study.

Abbreviations

ED

Emergency department

CPC

Chest pain center

D2FMC

Time from the patient's arrival at the hospital gate to the first medical contact

FMC2FE

Time from the patient's arrival at the hospital gate to the first medical contact FMC2BS: Time from the first medical contact to the blood sampling

BS2CBR

Time from the blood sampling to the cardiac biomarkers report

CBR2FAD

Time from the cardiac biomarkers report to the first antiplatelet drug

D2W

Time from the patient's arrival at the hospital gate to the opening of his/her occluded coronary arteries

Declarations

Availability of data and materials

The datasets generated and analyzed during the current study are not publicly available due to protect patient privacy but are available from the corresponding author on reasonable request

Ethics approval and consent to participate

The study was approved by the Ethics Committee of Guangyuan Central Hospital for retrospective data and the requirement for informed consent was waived as the identity of the patients in the study was kept

confidential and there was no impact or risk to the patients throughout the study.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ZYL: conception, acquisition of data, design, the analytical plan, drafting of the manuscript. SHL: Critical revision of the manuscript for important intellectual content. YYL and SYZ: Critical revision of the manuscript, approval of the final version to be published.

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References

1. 2020 Expert Consensus on the Prevention and Treatment of Heart Failure after Myocardial Infarction: Branch of Cardiovascular Physicians, Chinese Medical Doctor Association, Chinese Cardiovascular Association, The Expert Consensus Working Group on the Prevention and Treatment of Heart Failure after Myocardial Infarction. (2021). *Cardiology Plus*, 6(1), 4–20. <https://doi.org/10.4103/2470-7511.312595>
2. Alsolamy, S., Al-Sabhan, A., Alassim, N., Sadat, M., Qasim, E. A., Tamim, H., & Arabi, Y. M. (2018). Management and outcomes of patients presenting with sepsis and septic shock to the emergency department during nursing handover: A retrospective cohort study. *BMC Emergency Medicine*, 18, 1-N.PAG. <https://doi.org/10.1186/s12873-018-0155-8>
3. Alzahrani, N., Jones, R., & Abdel-Latif, M. E. (2019). Safety Attitudes among Doctors and Nurses in an Emergency Department of an Australian Hospital. *Journal of Clinical & Diagnostic Research*, 13(4), 5–8. <https://doi.org/10.7860/JCDR/2019/40742.12820>
4. Anderson, J., Malone, L., Shanahan, K., & Manning, J. (2015). Nursing bedside clinical handover – an integrated review of issues and tools. *Journal of Clinical Nursing*, 24(5–6), 662–671. <https://doi.org/10.1111/jocn.12706>
5. Dingcheng, X., & Shaodong, Y. (2017). Chest pain centers in China: Current status and prospects. *Cardiology Plus*, 2, 18. <https://doi.org/10.4103/2470-7511.248469>

6. Fan, F., Li, Y., Zhang, Y., Li, J., Liu, J., Hao, Y., Smith, S. C., Fonarow, G. C., Taubert, K. A., Ge, J., Zhao, D., Huo, Y., & CCC-ACS Investigators. (2019). Chest Pain Center Accreditation Is Associated With Improved In-Hospital Outcomes of Acute Myocardial Infarction Patients in China: Findings From the CCC-ACS Project. *Journal of the American Heart Association*, *8*(21), e013384. <https://doi.org/10.1161/JAHA.119.013384>
7. Gulati, M., Levy, P. D., Mukherjee, D., Amsterdam, E., Bhatt, D. L., Birtcher, K. K., Blankstein, R., Boyd, J., Bullock-Palmer, R. P., Conejo, T., Diercks, D. B., Gentile, F., Greenwood, J. P., Hess, E. P., Hollenberg, S. M., Jaber, W. A., Jneid, H., Joglar, J. A., Morrow, D. A., ... Shaw, L. J. (2021). 2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, *144*(22), e368–e454. <https://doi.org/10.1161/CIR.0000000000001029>
8. Ibanez, B., James, S., Agewall, S., Antunes, M. J., Bucciarelli-Ducci, C., Bueno, H., Caforio, A. L. P., Crea, F., Goudevenos, J. A., Halvorsen, S., Hindricks, G., Kastrati, A., Lenzen, M. J., Prescott, E., Roffi, M., Valgimigli, M., Varenhorst, C., Vranckx, P., Widimský, P., & ESC Scientific Document Group. (2018). 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European Heart Journal*, *39*(2), 119–177. <https://doi.org/10.1093/eurheartj/ehx393>
9. joint commission. (2009). The Joint Commission releases Improving America's Hospitals: The Joint Commission's Annual Report on Quality and Safety, 2008. *Joint Commission Perspectives. Joint Commission on Accreditation of Healthcare Organizations*, *29*(1), 3, 5.
10. Kim, E. J., & Seomun, G. (2020). Handover in Nursing: A Concept Analysis. *Research and Theory for Nursing Practice*, *34*(4), 297–320. <https://doi.org/10.1891/RTNP-D-19-00089>
11. Kumar, P., Jithesh, V., Vij, A., & Gupta, S. K. (2016). Need for a hands-on approach to hand-offs: A study of nursing handovers in an Indian Neurosciences Center. *Asian Journal of Neurosurgery*, *11*(1), 54–59. <https://doi.org/10.4103/1793-5482.165776>
12. Lin, T., Feng, X., Gao, Y., Li, X., Ye, L., Jiang, J., & Tong, J. (2021). Nursing interruptions in emergency room in China: An observational study. *Journal of Nursing Management*, *29*(7), 2189–2198. <https://doi.org/10.1111/jonm.13372>
13. Menozzi, A. (2018). An overview on STEMI. *Minerva Cardioangiologica*, *66*(4), 391. <https://doi.org/10.23736/S0026-4725.18.04712-6>
14. Pun, J. (2021). Factors associated with nurses' perceptions, their communication skills and the quality of clinical handover in the Hong Kong context. *BMC Nursing*, *20*, 1–8. <http://dx.doi.org/10.1186/s12912-021-00624-0>
15. Shen, Y., Jian, W., Zhu, Q., Li, W., Shang, W., & Yao, L. (2020). Nurse staffing in large general hospitals in China: An observational study. *Human Resources for Health*, *18*(1), 3. <https://doi.org/10.1186/s12960-020-0446-5>

16. Thomson, H., Tourangeau, A., Jeffs, L., & Puts, M. (2018). Factors affecting quality of nurse shift handover in the emergency department. *Journal of Advanced Nursing*, *74*(4), 876–886. <https://doi.org/10.1111/jan.13499>
17. Tortosa-Altad, R., Reverté-Villarroya, S., Martínez-Segura, E., López-Pablo, C., & Berenguer-Poblet, M. (2021). Emergency handover of critical patients. A systematic review. *International Emergency Nursing*, *56*, 100997. <https://doi.org/10.1016/j.ienj.2021.100997>
18. Xiang, D., Xiang, X., Zhang, W., Yi, S., Zhang, J., Gu, X., Xu, Y., Huang, K., Su, X., Yu, B., Wang, Y., Fang, W., Huo, Y., & Ge, J. (2020). Management and Outcomes of Patients With STEMI During the COVID-19 Pandemic in China. *Journal of the American College of Cardiology*, *76*(11), 1318–1324. <https://doi.org/10.1016/j.jacc.2020.06.039>
19. Zalenski, R. J., & Grzybowski, M. (2001). THE CHEST PAIN CENTER IN THE EMERGENCY DEPARTMENT. *Emergency Medicine Clinics of North America*, *19*(2), 469–481. [https://doi.org/10.1016/S0733-8627\(05\)70195-4](https://doi.org/10.1016/S0733-8627(05)70195-4)
20. Zhao, Y., Ding, S., Peng, W., Zhang, Y., & Xu, Y. (2020). A Smart Chest Pain Center to Improve Quality Control and Reduce Doctor's Workload of Acute Myocardial Infarction. *Critical Pathways in Cardiology*, *19*(4), 161–165. <https://doi.org/10.1097/HPC.0000000000000239>

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