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Title: Regional differences in ST-segment-elevation myocardial infarction care and outcome: a call for multi-national cardiovascular registries

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Disparities in the management of ST-elevation myocardial infarction (STEMI) undermine the opportunity to reduce the global burden of cardiovascular disease¹. Timely reperfusion therapy, preferably with primary percutaneous coronary intervention (PCI), as well as attainment to guideline-indicated care and secondary prevention measures reduce STEMI morbidity and mortality². Clinical registries play an important role in identifying gaps in STEMI care, regional variations in practice, and opportunities for improvement³. Furthermore, registries enable the evaluation of the differences in STEMI management between countries, which may help improve the prognosis following STEMI⁴.

International comparisons research using registry data, however, is constrained by the heterogeneity between existing registries⁵. For instance, countries, such as Sweden and the UK, have established national STEMI registries, yet studies comparing STEMI care and outcomes between Sweden and the UK were not facilitated by the differences in their respective registries' design, completeness, and coverage⁴. Across the Asian-Pacific region, where population is diverse and both economic and healthcare systems are at different stages of development, greater variation in STEMI care may be observed⁶.

Tern et al⁷. used already published data from twenty STEMI registries in 5 Asia-Pacific countries to compare STEMI care and mortality between these countries. In total, 158420 patients from Australia, Japan, Korea, Singapore and Malaysia, whom data were collected after the year 2000, were included in this meta-analysis. The authors described patient baseline characteristics, in-hospital treatment, and pooled estimates of in-hospital, 30-day,

and 1-year mortality rates. The analysis was supplemented by public health data and clinician-report surveys to evaluate systems of care in each of the 5 countries.

Tern et al . found that whilst national STEMI registries were available in all countries apart from Australia, only Singapore's was compulsory and recorded 'all-comers' STEMI patients. In addition, both within and between country variability across the selected registries was observed, with differences in data variables definitions, registry methodology, and inclusion criteria. Such variability may have contributed to the differences in STEMI outcomes between countries. For instance, unlike other registries, the Singapore Myocardial Infarction Registry included patients who had died out-of-hospital or in the emergency department, which may explain why higher STEMI mortality rates were seen in Singapore.

Nonetheless, pooled estimates of data allowed the reviewers to conduct meaningful comparisons between the 5 countries. They reported that different countries had different STEMI patient demographics and co-morbidities. A finding that have been previously reported both within and outside the Asia-Pacific region⁶, and reflect the geographical differences in acute myocardial infarction (AMI) patient profile. In Europe in particular, substantial variation in patient characteristics has been observed between Central, Eastern, Western, and Northern countries¹.

The authors concluded that, notwithstanding the 5 countries had similar development and public health indices, there were significant variations in STEMI management and mortality rates. One of the most striking variation in care delivery for STEMI patients was the reperfusion treatment. Primary percutaneous coronary intervention (PCI) rates varied from

over 90% to around 9% in Korea and Malaysia, respectively. The other 3 countries had primary PCI rates comparable to these observed in Europe¹. These figures were matched with variations in thrombolysis rates across the 5 countries, with highest rates in Malaysia (72.6%) and lowest in Singapore (1.1%).

In addition to the variation in reperfusion treatment, different countries had variable adherence to secondary prevention medications following STEMI. The appropriate use of such medications has been shown to improve outcomes², and is proposed as an indicator of care quality⁸. However, to assess the appropriateness of care, data that are both reliable and sufficient, including potential exceptions (e.g., contraindication)⁹, are needed. Thus, it is imperative for clinical registries to capture high-quality data about important processes of STEMI care to allow the distinction between good and poor practice.

The reviewers reported that Malaysia and Singapore had higher mortality rates from STEMI than the other 3 countries. They explained that this could be attributed to the wide inclusion criteria of the STEMI registry in Singapore, the lower use of primary PCI in Malaysia, and/or the greater ethnic diversities in these 2 countries. Although it is difficult to infer causation from observational data, similar association between high reliance on thrombolysis therapy for STEMI and increased mortality rates was observed in Eastern European countries¹. However, when using an outcome measure for benchmarking, differences may be due to factors other than quality of care (e.g., case-mix)¹⁰, which need adjusting for.

Mapping the geographical differences in STEMI presentation, management, and outcomes is critical to address gaps in care delivery¹. For the Asian-Pacific region and beyond, nationwide registries are integral to quality improvement initiatives¹¹. As such, quality indicators that are developed methodologically⁹, can be implemented within registries to measure performance¹² and disparities in care provision¹³. Future registries, such as the European Unified Registries On Heart Care Evaluation and Randomized Trials (EuroHeart), will use harmonized data standards and provide a unified platform for continuous data collection, which can facilitate international comparisons of cardiovascular disease¹⁴.

Conflict of Interest: none declared

Reference:

1. Puymirat E, Battler A, Birkhead J, Bueno H, Clemmensen P, Cottin Y, Fox KA, Gorenek B, Hamm C, Huber K, Lettino M, Lindahl B, Müller C, Parkhomenko A, Price S, Quinn T, Schiele F, Simoons M, Tatu-Chitoiu G, Tubaro M, Vrints C, Zahger D, Zeymer U, Danchin N and participants EHSs. Euro Heart Survey 2009 Snapshot: regional variations in presentation and management of patients with AMI in 47 countries. *Eur Heart J Acute Cardiovasc Care*. 2013;2:359-370.
2. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, Caforio ALP, Crea F, Goudevenos JA, Halvorsen S, Hindricks G, Kastrati A, Lenzen MJ, Prescott E, Roffi M, Valgimigli M, Varenhorst C, Vranckx P, Widimský P and Group ESCSD. 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*. 2017;39:119-177.
3. Jernberg T, Johanson P, Held C, Svennblad B, Lindback J and Wallentin L. Association between adoption of evidence-based treatment and survival for patients with ST-elevation myocardial infarction. *JAMA*. 2011;305:1677-1684.
4. Chung S-C, Gedeberg R, Nicholas O, James S, Jeppsson A, Wolfe C, Heuschmann P, Wallentin L, Deanfield J, Timmis A, Jernberg T and Hemingway H. Acute myocardial infarction: a comparison of short-term survival in national outcome registries in Sweden and the UK. *The Lancet*. 2014;383:1305-1312.

5. Biswas S, Lefkovits J, Liew D, Gale CP, Reid CM and Stub D. Characteristics of national and major regional percutaneous coronary intervention registries: A structured literature review. *EuroIntervention*. 2018;14:1112-1120.
6. Rosselló X, Huo Y, Pocock S, Van de Werf F, Chin CT, Danchin N, Lee SW, Medina J, Vega A and Bueno H. Global geographical variations in ST-segment elevation myocardial infarction management and post-discharge mortality. *Int J Cardiol*. 2017;245:27-34.
7. Tern PJW, Ho AKH, Sultana R, Ahn Y, Almahmeed W, Brieger D, Chew DP, Fong AYY, Hwang J, Kim Y, Komuro I, Maemura K, Mohd-Ali R, Quek DKL, Reid C, Tan JWC, Wan-Ahmad WA, Yasuda S and Yeo KK. Comparative Overview of ST-Elevation Myocardial Infarction (STEMI) Epidemiology, Demographics, Management and Outcomes in 5 Asia-Pacific Countries – A Meta-Analysis. 2020.
8. Schiele F, Gale CP, Bonnefoy E, Capuano F, Claeys MJ, Danchin N, Fox KA, Huber K, Iakobishvili Z, Lettino M, Quinn T, Rubini Gimenez M, Botker HE, Swahn E, Timmis A, Tubaro M, Vrints C, Walker D, Zahger D, Zeymer U and Bueno H. Quality indicators for acute myocardial infarction: A position paper of the Acute Cardiovascular Care Association. *European heart journal Acute cardiovascular care*. 2017;6:34-59.
9. Aktaa S, Batra G, Wallentin L, Baigent C, Erlinge D, James S, Ludman P, Maggioni A, Price S, Weston C, Casadei B and Gale CP. European Society of Cardiology methodology for the development of quality indicators for the quantification of cardiovascular care and outcomes. 2020.
10. Lilford R, Mohammed MA, Spiegelhalter D and Thomson R. Use and misuse of process and outcome data in managing performance of acute medical care: avoiding institutional stigma. *Lancet*. 2004;363:1147-54.
11. Bhatt DL, Drozda JP, Shahian DM, Chan PS, Fonarow GC, Heidenreich PA, Jacobs JP, Masoudi FA, Peterson ED and Welke KF. ACC/AHA/STS Statement on the Future of Registries and the Performance Measurement Enterprise. *Journal of the American College of Cardiology*. 2015;66:2230-2245.
12. Bebb O, Hall M, Fox KAA, Dondo TB, Timmis A, Bueno H, Schiele F and Gale CP. Performance of hospitals according to the ESC ACCA quality indicators and 30-day mortality for acute myocardial infarction: national cohort study using the United Kingdom Myocardial Ischaemia National Audit Project (MINAP) register. *European Heart Journal*. 2017;38:974-982.
13. Wilkinson C, Bebb O, Dondo TB, Munyombwe T, Casadei B, Clarke S, Schiele F, Timmis A, Hall M and Gale CP. Sex differences in quality indicator attainment for myocardial infarction: a nationwide cohort study. *Heart*. 2019;105:516.
14. Wallentin L, Gale CP, Maggioni A, Bardinet I and Casadei B. EuroHeart: European Unified Registries On Heart Care Evaluation and Randomized Trials. *European Heart Journal*. 2019;40:2745-2749.