EDITORIAL

Day versus night in the catheterization laboratory: all the same

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RELATED ARTICLE
by Januszek et al,
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In this issue of *Polish Archives of Internal Medicine* (*Pol Arch Intern Med*), Januszek et al[1] report on a cohort of patients with acute myocardial infarction (AMI) from the Polish National Registry of Invasive Cardiology Procedures (Polish, Ogólnopolski Rejestr Procedur Kardiologii Inwazyjnej [ORPKI]). They evaluated mortality based on whether percutaneous coronary intervention (PCI) occurred during daytime hours or at night. Mortality assessment was performed at hospital discharge, at 1 month, at 12 months, and at 36 months. Compared with patients admitted during the day, those admitted at night showed a higher 1-month mortality but similar mortality at discharge, 12 months, and at 36 months.

This finding must be interpreted in light of previous studies. The question of whether outcomes of patients with AMI differ depending on time of PCI has been studied for 2 decades.[2] Different studies have reached different conclusions. Some indicate no effect of PCI time,[3] whereas others have found worse outcomes in patients undergoing PCI outside of regular working hours.[4]

Three factors might account for worse outcomes in patients undergoing PCI outside of regular working hours. The first is a diurnal biological difference in patients, seen between the day and the night (eg, diurnal blood pressure variation that affects outcomes).[5] The second is a difference in presentation of patients (eg, patients only present after working hours because of severe life-threatening symptoms, but will present with milder symptoms early during regular working hours). The third is a difference in systems of care (eg, slower or less effective care outside of regular working hours).[4,6-8]

Many studies have shown similar outcomes of PCI regardless of time of the day (daytime versus night-time)[3] and regardless of regular working hours versus off hours (usually defined as night--time hours and weekends).[9] Thus, it seems unlikely that either diurnal biologic mechanisms or systematic differences in presentation play a large role. Differences in outcomes between the night and the day are probably more related to variations in systems of care between the night and the day.[6]

Januszek et al[1] studied a total of 7 endpoints: mortality at discharge, 1 month, 12 months, and 36 months, as well as major adverse cardiovascular and cerebrovascular adverse events at 1, 12, and 36 months after discharge. They found statistically significant differences only in mortality at 30 days, a trend toward a similar difference in mortality at discharge, and minimal, nonsignificant differences in mortality at 12 and 36 months and in major adverse cardiovascular and cerebrovascular adverse events at any time. If one of the several endpoints favored day-time PCI and all others trended in that direction, one might wonder if a larger study would have yielded statistical significance.[10] But when a significant difference is observed in only 1 of 7 endpoints, with no consistent trends in the other 6 endpoints, one must question the clinical significance of this finding.[11] In the study by Januszek et al,[1] the clinical significance of a mortality difference at 1 month, if any, remains unclear. However, it does raise the question of whether differences in day-time versus night-time care may have played a role affecting outcomes.

Januszek et al[1] do document some differences in care between patients receiving PCI at night versus during the day. Although Januszek et al[1] do not present exact data, it appears that PCI for non–ST-segment elevation myocardial infarction (STEMI) was routinely delayed until the next day in patients presenting at night, while patients with STEMI routinely underwent emergent PCI regardless of time of presentation. Patients undergoing PCI at night more often presented with STEMI (since patients with STEMI were less likely to be put off until the following day), were younger (reflecting the younger age of patients with STEMI), had shorter first-medical-contact-to--balloon times (reflecting more PCIs for STEMI

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at night), and were more often managed via femoral access (presumably owing to a preference for femoral access in emergent STEMI situations).

The quality of care between daytime and night-time PCI is not easily assessed from the data presented, but suggests similar or even better care at night. First-medical-contact-to-balloon time was shorter at night than during the day (80 vs 103 minutes, P <0.001), reflecting an excellent night-time system of care. Complications and the angiographic success of PCI were similar for daytime and night-time PCI.

Januszek et al[1] report several observations that confirm previous reports. The burden of comorbidities was higher in non-STEMI patients undergoing PCI.[12] Early mortality was higher in STEMI patients than in non-STEMI patients, but late mortality was similar.[12] Longer pain-to-balloon times were associated with higher mortality.[13] Correlates of late mortality included stroke, kidney disease, cardiac arrest, a higher Killip class, and baseline patency of the culprit artery.[12]

Several factors hindered the analysis of Januszek et al.[1] Unlike most other studies on this issue, they analyzed STEMI and non-STEMI PCIs together rather than analyzing them as separate groups. They defined daytime hours as a time interval between 7 AM and 11 PM, whereas usually "daytime" is considered to be between 7 AM and 5 PM or between 7 AM and 7 PM.[7] They did not distinguish weekend daytimes from weekday daytimes, so they could not look for a "weekend effect."[14] Several other factors make their data atypical. First, the ratio of STEMI to non-STEMI PCIs was about 2:1 as compared with the American College of Cardiology National Cardiovascular Data CathPCI Registry where the ratio is about 1:4; this suggests that many non-STEMI patients were treated conservatively and only a selected group received PCI. Second, pain-to-balloon times and first-medical-contact-to-balloon times were shorter for night-time PCIs in contrast to most other studies where times are longer at night.[15] This raises the question of whether congestion in catheterization laboratories during the day led to delays in providing urgent care and might explain why they defined "daytime" as 7 AM to 11 PM; perhaps routine catheterization procedures are performed 16 hours per day in ORPKI-reporting hospitals.

In summary, Januszek et al[1] have documented that outcomes of PCI for AMI in ORPKI-reporting hospitals are similar at night and during the day. Polish physicians and their patients can be reassured that invasive treatment of AMI is prompt and successful 24 hours a day.

ARTICLE INFORMATION

DISCLAIMER The opinions expressed by the author are not necessarily those of the journal editors, Polish Society of Internal Medicine, or publisher.

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REFERENCES

1 Januszek R, Siudak Z, Janion-Sadowska J, et al Effect of day- and night-time admissions on long-term clinical outcomes of patients with acute myocardial infarction treated with percutaneous coronary intervention. Pol Arch Intern Med. 2020; 130: 570-581.

2 Zahn R, Schiele R, Seidl K, et al. Daytime and nighttime differences in patterns of performance of primary angioplasty in the treatment of patients with acute myocardial infarction. Am Heart J. 1999; 138: 1111-1117.

3 Uyarel H, Ergelen M, Akkaya E, et al. Impact of day versus night as intervention time on the outcomes of primary angioplasty for acute myocardial infarction. Cathet Cardiovasc Intervent. 2009; 74: 826-34.

4 Jayawardana S, Salas-Vega S, Cornehl F, et al. The relationship between off-hours admissions for primary percutaneous coronary intervention, door-to-balloon time and mortality for patients with ST-elevation myocardial infarction in England: a registry-based prospective national cohort study. BMJ Qual Safety. 2020; 29: 541-549.

5 Takeda N, Maemura K. Circadian clock and the onset of cardiovascular events. Hypertension Res. 2016; 39: 383-390.

6 Glaser R, Naidu SS, Selzer F, et al. Factors associated with poorer prognosis for patients undergoing primary percutaneous coronary intervention during off-hours: biology or systems failure? JACC Cardiovasc Interv. 2008; 1: 681-688.

7 Aranow HD, Gurm HS, Blankenship JC, et al. Middle-of-the-night percutaneous coronary intervention and its association with percutaneous coronary intervention outcomes performed the following day. JACC Cardiovasc Interv. 2015; 8: 49-56.

8 Crudu V, Sartorius J, Berger PB, et al. Middle-of-the-night PCI does not affect subsequent day PCI success and complication rates by the same operator. Cathet Cardiovasc Interv. 2012; 80: 1149-1154.

9 Graham MM, Ghali WA, Southern DA, et al; APPROACH Investigators. Outcomes of after-hours versus regular working hours primary percutaneous coronary intervention for acute myocardial infarction. BMJ Qual Safety. 2011; 20: 60-67.

10 Greenland S, Senn SJ, Rothman KJ, et al. Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations. Euro J Epidem. 2016; 31: 337-350.

11 Snapinn S. Some remaining challenges regarding multiple endpoints in clinical trials. Stat Med. 2017; 36: 4441-4445.

12 Chan MY, Sun JL, Newby LK, et al. Long-term mortality of patients undergoing cardiac catheterization for ST-elevation and non-ST-elevation myocardial infarction. Circulation. 2009; 119: 3110-3117.

13 Rathore SS, Curtis JP, Chen J, et al. Association of door-to-balloon time and mortality in patients admitted to hospital with ST elevation myocardial infarction: national cohort study. BMJ. 2009; 338: 1-7.

14 Malanchini G, Stefanini GG, Malanchini M, Lombardi F. Higher in-hospital mortality during weekend admission for acute coronary syndrome: a large-scale cross-sectional Italian study. J Cardiovasc Med. 2019; 20: 74-80.

15 Cubeddu RJ, Palacios IF, Blankenship JC, et al. Outcome of patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention during on-versus off-hours: a HORIZONS-AMI Trial sub-study. Am J Cardiol. 2013; 111: 946-954.