Comparative Analysis of Percutaneous Revascularization Practice in the United States and the United Kingdom: Insights from the BMC2 and BCIS Databases

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ABSTRACT

Background:
We compared clinical practice patterns, procedural outcomes, and trends in percutaneous coronary intervention (PCI) utilization using a state-wide PCI registry in the United states and a national registry from the United Kingdom (UK).

Methods:
We analyzed all PCI cases from the Blue Cross Blue Shield of Michigan Cardiovascular Consortium and the British Cardiovascular Intervention Society registries from 2010-2017. Procedural characteristics and in-hospital outcomes were stratified by PCI indication.

Results:
248,283 cases were performed in Michigan (MI) and 773,083 in the UK during the study period. The proportion of patients with a prior diagnosis of diabetes in MI was nearly double that in the UK (38.9% vs. 21.0%). Primary PCI was more frequent in the UK (25% UK vs. 14.3% MI). Radial access increased in both registries (86.8% in the UK vs. 45.1% in MI the final year of the study). Mechanical support fell to 0.9% of cases in the UK and rose to 3.95% of cases in MI in 2017. Unadjusted crude mortality rates were similar, with higher rates of post-PCI transfusion and other complications in the Michigan population.

Conclusions:
While overall outcomes are broadly similar, there are significant differences in PCI practice between the US and UK. Notable findings include a marked difference in diabetes prevalence, a greater proportion of primary PCI and more robust adoption of transradial PCI in the UK. Mechanical support increased during the study period in Michigan and declined in the UK.

BACKGROUND

- Real-world PCI practice patterns continue to evolve with respect to patient demographics and procedural characteristics
- Quality improvement registries and data tracking provide opportunities to measure outcomes and evaluate practice patterns against national benchmarks
- National data may be subject to similar influences based on regional and cultural continuity, shared national society guidelines, and healthcare delivery models.
- International comparisons may be particularly enlightening especially amongst geographically separate populations participating in alternate healthcare delivery models

OBJECTIVE & METHODS

- To compare PCI practices from two large quality-improvement data registries:
  - British Cardiovascular Intervention Society (BCIS)
  - Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2)
- Data from 2010-2017 stratified by PCI indication
  - Absolute standardized differences to describe variance in data
  - Year-to-year trends reported for select variables of interest

RESULTS

Figure 1: Annual trends in PCI indication

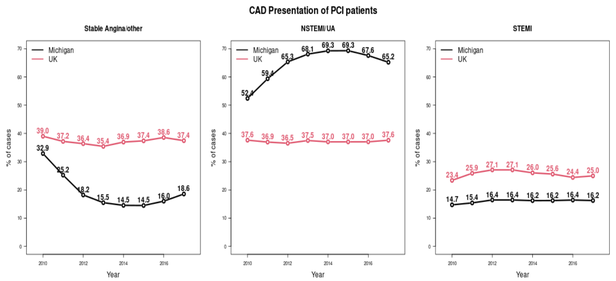

Figure 2: Annual trends in radial access utilization

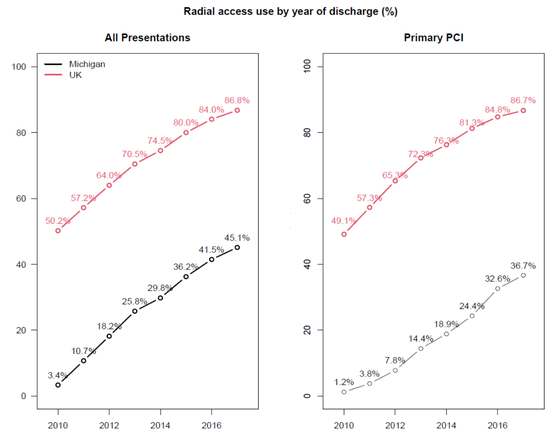

Figure 3: Annual trends in mechanical ventricular support and IABP use

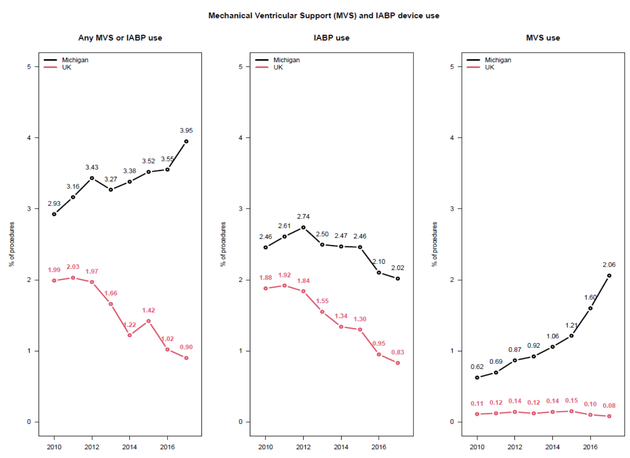

Table 1: PCI patient indications, demographics and medical comorbidities

	Michigan (N=248,283)	UK (N=773,083)	Absolute Std. Diff.
Presentation/indication			
All ACS	80.5%	62%	48%
Primary PCI for STEMI	14.3%	25%	27%
NSTEMI/UA	64.5%	37%	62%
Unstable Angina	42.0%	-	N/A
Stable CAD	19.5%	37%	38%
Demographic characteristics			
Age	65 ± 12	65 ± 12	0%
Male	66.8%	74%	16%
Non-white	13.8%	15%	4%
Comorbidities			
Prior MI	35.0%	27%	17%
Prior CABG	18.1%	8%	29%
Prior PCI	45.7%	26%	43%
Diabetes	38.9%	21%	39%
Tobacco use	28.7%	24%	11%
Hypertension	85.4%	56%	69%
Hyperlipidemia	81.4%	53%	63%
Prior Stroke	15.5%	4%	39%
Dialysis	2.5%	1%	12%

Table 2: Patient profiles, procedural characteristics, and outcomes in Primary PCI for STEMI

	Michigan (N=36,442)	UK (N=195,234)	Absolute Std. Diff.
Presentation and Procedural characteristics: STEMI			
Median symptom-to-door time (mins)	106 (59-201)	120 (80-223)	N/A
Median door-to-device time	73 (55-95)	55(33-107)	N/A
Cardiac arrest	9.7%	9%	2%
Pre-PCI Shock	10.1%	8%	7%
Radial access	18.5%	70%	121%
Femoral access	81.3%	27%	130%
IIb/IIIa	57%	45%	24%
IVUS/OCT	3.2%	4%	4%
Thrombectomy	20.5%	40%	46%
IABP Support	9.8%	4%	24%
Impella Support	1.6%	0.02%	17%
CPS/ECMO	<0.01%	0.03%	2%
In-Hospital Outcomes after Primary PCI			
Death	5.9%	5%	2%
CVA/TIA	0.68%	0.22%	7%
Renal Failure/HD	1.0%	0.2%	11%
Transfusion	5.7%	0.63%	29%
Post-PCI CABG	2.4%	0.40%	17%

Table 3: Patient profiles, procedural characteristics, and outcomes in PCI for stable CAD

	Michigan (N=49,888)	UK (N=284,745)	Absolute Std. Diff.
Presentation and Procedural characteristics: Stable CAD			
No Angina	32.4%	8%	65%
CCS 1	8%	10%	8%
CCS 2	34.9%	43%	17%
CCS 3	22.5%	36%	31%
CCS 4	2.1%	3%	5%
Radial access only	24.4%	66%	92%
Femoral access only	75.2%	30%	102%
IIb/IIIa	16.8%	12%	14%
IVUS/OCT use	64%	11%	133%
Atherectomy	2.7%	3%	4%
Left main PCI	3.2%	5%	11%
Proximal LAD	18.8%	24%	14%
Graft PCI	5.6%	3%	13%
Multivessel PCI	13.5%	22%	22%
CTO PCI	5%	12%	26%
IABP support	0.45%	0.17%	5%
Impella support	1.1%	0.02%	14%
In-Hospital Outcomes after Primary PCI			
Death	0.43%	0.15%	5%
CVA/TIA	0.015%	0.05%	3%
Renal Failure/HD	0.13%	0.02%	4%
Transfusion	1.54%	0.42%	11%
Post-PCI CABG	0.35%	0.13%	4%

CONCLUSION

- Notable findings included marked differences in diabetes and other comorbidities and a greater proportion of primary PCI in the UK
- Uptake of transradial PCI was earlier and more robust in the UK
- Trends in mechanical support were divergent, with increasing use during PCI in Michigan
- Unadjusted crude mortality rates were similar in the two registries
- International comparisons are useful external points of reference for quality outcomes and generate opportunities for collaborative quality improvement initiatives