Hypertensive disorders of pregnancy and the recent increase in obstetric acute renal failure in Canada: population based retrospective cohort study

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- Research: Chronic hypertension and pregnancy outcomes: systematic review and meta-analysis (*BMJ* 2014;348:g2301)
- Practice: Management of hypertensive disorders during pregnancy: summary of NICE guidance (*BMJ* 2010;341:c2207)
- Research: Impact of bariatric surgery on hypertensive disorders in pregnancy: retrospective analysis of insurance claims data (*BMJ* 2010;340:c1662)

STUDY QUESTION

Do changes in rates of postpartum haemorrhage, hypertensive disorders of pregnancy, or other risk factors explain the recent increase in obstetric acute renal failure in Canada?

SUMMARY ANSWER

The increase in obstetric acute renal failure in Canada during 2003-10 was almost entirely restricted to the 6% of women with hypertensive disorders of pregnancy, and was especially pronounced among the 1% of women with pre-eclampsia, defined in the study as gestational hypertension with significant proteinuria.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Obstetric acute renal failure has increased in both Canada (between 2003 and 2007) and the United States (between 1998 and 2009), concurrent with a rise in postpartum haemorrhage. This study showed that the increase in acute renal failure in Canada was unrelated to changes in postpartum haemorrhage; in fact, it was restricted to the subpopulation of women with hypertensive disorders of pregnancy, especially among women with pre-eclampsia.

Participants and setting

We included all live births and stillbirths that occurred in Canadian hospitals (excluding those in the province of Quebec).

Design, size, and duration

This retrospective cohort study included all hospital deliveries in 2003-10 (n=2 193 425), and the data source was the discharge abstract database of the Canadian Institute for Health Information. The main determinant of interest was atonic and non-atonic postpartum haemorrhage. Other determinants of interest included hypertensive disorders of pregnancy, diabetes, and other risk factors for obstetric acute renal failure.

Temporal trends in obstetric acute renal failure among women according to health status in pregnancy, Canada (excluding Quebec), 2003-10 (n=2 193 425)

Health status in pregnancy	Rate per 10 000 deliveries		Adjusted odds ratio (95% CI): 2009-10 *v* 2003-04
	2003-04	2009-10	
Hypertensive disorders	15.6	28.8	1.95 (1.38 to 2.76)
Gestational hypertension with significant proteinuria	45.5	109.6	2.71 (1.71 to 4.29)
No hypertensive disorders	0.77	0.93	1.12 (0.72 to 1.72)

Main results

There were 502 cases of obstetric acute renal failure in the study population and the rate increased by 61% (95% confidence interval 24% to 110%), from 1.66 per 10 000 deliveries in 2003-04 to 2.68 per 10 000 in 2009-10. The increase coincided with a rise in postpartum haemorrhage; however, the increase occurred among women both with and without postpartum haemorrhage. The temporal increase in acute renal failure was restricted to women with hypertensive disorders (95% adjusted increase between 2003-04 and 2009-10, 95% confidence interval 38% to 176%), and was especially pronounced among women with gestational hypertension with significant proteinuria (171%, 95% confidence interval 71% to 329%). No significant increase in obstetric acute renal failure occurred among women without hypertensive disorders (12%, −28% to 72%).

Bias, confounding, and other reasons for caution

Limitations of our study included a potentially inaccurate diagnosis of obstetric acute renal failure or possible changes in diagnosis over time. However, no significant changes in severity were observed, as measured by acute renal failure in conjunction with maternal death, admission to an intensive care unit, or dialysis. In addition, we did not assess long term renal function among women with a diagnosis of obstetric acute renal failure.

Generalisability to other populations

Changes in pre-eclampsia management (for example, fluid restriction) and increased use of non-steroidal anti-inflammatory drugs for pain management are likely to have occurred in other settings. Further study is recommended to determine whether a similar increase in acute renal failure occurred among women with pre-eclampsia in other settings.

Study funding/potential competing interests

This work was supported by a Canadian Institutes of Health Research team grant in severe maternal morbidity (MAH-115445). We have no competing interests.

Tranexamic acid use and postoperative outcomes in patients undergoing total hip or knee arthroplasty in the United States: retrospective analysis of effectiveness and safety

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- Clinical Review: Transfusing blood safely and appropriately (*BMJ* 2013;347:f4303)
- Research: Effect of tranexamic acid on surgical bleeding: systematic review and cumulative meta-analysis (*BMJ* 2012;344:e3054)

STUDY QUESTION

In a national sample of total hip and total knee arthroplasties, is the perioperative use of tranexamic acid associated with a decreased need for blood transfusions without an increased risk for particularly thromboembolic and renal complications?

SUMMARY ANSWER

Perioperative use of tranexamic acid is associated with an up to 69% decreased risk for blood transfusions with no significantly increased risk for thromboembolic and renal complications.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Tranexamic acid has been shown to reduce perioperative blood loss and blood transfusions in orthopedic surgery when studied in selective clinical trials with limited sample size. Next to demonstrating that tranexamic acid is associated with a decreased risk for blood transfusions (effectiveness), our national dataset showed no increased risk for rare complications such as thromboembolic events and acute renal failure associated with use of tranexamic acid.

Participants and setting

From the claims based Premier Perspective database we selected patients undergoing elective, primary total knee or hip arthroplasties between January 2006 and October 2012.

Design, size, and duration

This retrospective cohort study consisted of 872 416 patients from 510 hospitals in the United States. The main exposure was perioperative intravenous use of tranexamic acid. The main outcomes were allogeneic or autologous blood transfusion (combined and separate), thromboembolic complications, and acute renal failure. After adjustment for comorbidity burden, patient characteristics, and healthcare and procedure related variables we measured the associations between perioperative use of tranexamic acid and outcomes. To measure these effects we used multilevel multivariable logistic regression analysis and propensity score analysis.

Main results and the role of chance

Perioperative use of tranexamic acid increased dramatically, from almost 0% (n=2) in 2006 to 11.2% (n=12 903) in 2012. In the multilevel models, dose categories for tranexamic acid (versus no tranexamic acid) were associated with significantly (P<0.001) decreased odds for allogeneic or autologous blood transfusions (odds ratio 0.31 to 0.38 by dose category) and no significantly increased risk for complications: thromboembolic complications (0.85 to 1.02), acute renal failure (0.70 to 1.11), and combined complications (0.75 to 0.98). The same pattern was seen in the propensity score analysis.

Bias, confounding, and other reasons for caution

The most important limitations of this study are a lack of detailed clinical information, most importantly hemoglobin levels, or other transfusion triggers; no information on the actual dose of tranexamic acid administered (as opposed to the billed dose); and only complications that happened during hospital stay could be studied.

Generalizability to other populations

The study population is based on a national sample from a wide range of hospitals, thus making the results generalizable to patients undergoing knee and hip arthroplasties in healthcare systems similar to the United States.

Study funding/potential competing interests

Contributions of JP, RR, and MM on this project were partly funded by the Clinical Translational Science Center, New York, NY. SGM is funded by the Anna Maria and Stephen Kellen Career development award, New York, NY. We have no competing interests.

Results from multilevel logistic regression model and propensity score analysis for primary outcomes. Values are odds ratios (95% confidence intervals)

	Multilevel logistic regression†			Propensity score analysis
Outcomes	Tranexamic acid ≤1000 mg	Tranexamic acid 2000 mg	Tranexamic acid ≥3000 mg	Tranexamic acid *v* no tranexamic acid
Allogeneic or autologous transfusion	0.38 (0.35 to 0.42)*	0.31 (0.28 to 0.34)*	0.31 (0.27 to 0.36)*	0.50 (0.45 to 0.55)*
Allogeneic transfusion only	0.37 (0.33 to 0.41)*	0.29 (0.26 to 0.32)*	0.31 (0.27 to 0.37)*	0.47 (0.42 to 0.53)*
Thromboembolic complications	1.02 (0.71 to 1.45)	0.99 (0.70 to 1.39)	0.85 (0.53 to 1.35)	0.86 (0.59 to 1.25)
Acute renal failure	0.80 (0.63 to 1.02)	0.70 (0.55 to 0.88)*	1.11 (0.84 to 1.45)	0.74 (0.57 to 0.96)*

*P<0.05.
†Reference group was no tranexamic acid.

Impact of centralising acute stroke services in English metropolitan areas on mortality and length of hospital stay: difference-in-differences analysis

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STUDY QUESTION

What was the impact on mortality and length of hospital stay of centralising acute stroke services in two metropolitan areas of England?

SUMMARY ANSWER

In London, where hyperacute care was provided to all stroke patients, there was a significant reduction in mortality and length of hospital stay. In Greater Manchester, where hyperacute care was provided only to patients presenting within four hours of developing stroke symptoms, there was no impact on mortality but length of stay in hospital fell.

WHAT IS KNOWN AND WHAT THIS PAPER ADDS

Organised inpatient stroke unit care, which is provided by multidisciplinary teams that exclusively manage stroke patients in a dedicated ward, is associated with better quality care and reduced mortality and dependency. After the centralisation of acute stroke services across two metropolitan areas of England in 2010, the centralised model of care, in which hyperacute care was provided to all patients with stroke across an entire metropolitan area, was associated with reduced mortality and length of hospital stay.

Participants and setting

Study participants were patients with stroke living in urban areas of England admitted to acute stroke services. In 2010, acute stroke services were centralised across two metropolitan areas of England. In London specialist care was provided to all patients in eight hyperacute stroke units 24 hours a day, seven days a week. In Greater Manchester patients presenting within four hours of developing stroke symptoms were taken to a comprehensive stroke centre or primary stroke centre and received hyperacute stroke care; all other patients were taken to a district stroke centre providing specialist post-thrombolysis stroke care.

Absolute differences in risk adjusted mortality and length of hospital stay between Greater Manchester and London compared with rest of England before and after centralisation of acute stroke services. Figures are for all types of stroke combined in patients living in urban areas

	Difference-in-differences* (95% CI), P value	
	Greater Manchester minus rest of England	London minus rest of England
Risk adjusted mortality:		
At 3 days	−0.04 (−0.7 to 0.6), 0.90	−1.0 (−1.5 to −0.4), <0.001
At 30 days	0.8 (−0.3 to 1.9), 0.15	−1.3 (−2.2 to −0.4), 0.005
At 90 days	0.1 (−1.1 to 1.3), 0.89	−1.1 (−2.1 to −0.1), 0.03
Risk adjusted length of hospital stay (days)	−2.0 (−2.8 to −1.2), <0.001	−1.4 (−2.3 to −0.5), 0.002

*Values are risk adjusted difference-in-differences between regions showing change over time in Greater Manchester and London minus change over time in rest of England.

Design, size, and duration

We undertook a difference-in-differences analysis between regions using patient level data for 258 915 patients with stroke admitted to acute stroke services from January 2008 to 2012.

Main results and the role of chance

During the study period risk adjusted mortality and length of hospital stay fell in Greater Manchester, London, and the rest of England. In London there was a significant reduction in mortality at 3, 30, and 90 days after admission over and above the reduction seen in the rest of England; at 90 days the absolute reduction was −1.1% (95% confidence interval −2.1 to −0.1). There was also a significant reduction in length of hospital stay of −1.4 days (−2.3 to −0.5) over and above the reduction seen in the rest of England. In Greater Manchester there was no impact on mortality over and above the change seen in the rest of England, but there was a significant reduction in length of hospital stay by −2.0 days (−2.8 to −1.2).

Bias, confounding, and other reasons for caution

We were unable to adjust for severity of stroke, and our data do not include patients who died before they reached the hospital. Supplementary data suggest these factors are unlikely to affect our findings.

Generalisability to other populations

Similar models of care adapted to local need could be applied to other large metropolitan areas and other conditions. Our findings might be less relevant to stroke services operating in rural settings, where greater travel distances make centralisation challenging.

Study funding/potential competing interests

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