

Outcomes after vacuum-assisted deliveries *Births attended by community family practitioners*

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ABSTRACT

OBJECTIVE To assess success rates, modes of delivery following failure, complications of mothers and newborns, and effect of extractor station and parity on vacuum-assisted deliveries attended by family physicians.

DESIGN Retrospective audit.

SETTING Community hospital.

PARTICIPANTS Thirty-five family physicians providing maternity care.

MAIN OUTCOME MEASURES Complications, parity, and extractor station of 153 vacuum-assisted deliveries from April 1, 2000, to March 31, 2003.

RESULTS Family physicians attempted 153 vacuum deliveries (82 at low station, 71 at outlet station) and had a 94.1% success rate. Of nine failed vacuum deliveries (eight at low station and one at outlet station), four were subsequently delivered by forceps and five by cesarean section. Except for one case of subdural hematoma, complications were few. Nulliparity was associated with six of the nine failed vacuum deliveries.

CONCLUSION Family physicians were usually successful with vacuum-assisted deliveries. Complications were infrequent and rapidly resolved, but one failure, which was followed by a failed forceps delivery and eventual cesarean section, resulted in a serious complication. Low station and nulliparity were associated with failure of vacuum-assisted deliveries.

RÉSUMÉ

OBJECTIF Évaluer le taux de succès et les complications maternelles et fœtales d'accouchements effectués à l'aide d'une ventouse obstétricale par des médecins de famille. Déterminer l'effet de la parité et de la station à l'extraction ainsi que le type d'accouchement en cas d'échec.

TYPE D'ÉTUDE Étude rétrospective sur dossiers.

CONTEXTE Hôpital communautaire.

PARTICIPANTS Trente-cinq médecins de famille pratiquant l'obstétrique.

PRINCIPAUX PARAMÈTRES ÉTUDIÉS Complications, parité et station à l'extraction pour 153 accouchements avec recours à une ventouse entre le 1^{er} avril 2000 et le 31 mars 2003.

RÉSULTATS Pour 153 de ces accouchements (82 à la station plus 2 et 71 à la station zéro), les médecins de famille ont eu un taux de réussite de 94,1%. Quatre des neuf échecs (huit à la station plus 2 et un à la station zéro) ont nécessité des forceps et les cinq autres, une césarienne. À part un cas d'hématome sous-dural, il y a eu peu de complications. Signalons que six des neuf échecs sont survenus chez des nullipares.

CONCLUSION En général, les médecins de famille utilisaient la ventouse obstétricale avec succès. Les rares complications étaient vite résolues. Dans un cas, cependant, l'échec de la ventouse suivi d'un forceps infructueux et d'une césarienne a donné lieu à une complication sérieuse. Les échecs étaient plus fréquents chez les nullipares et à la station plus 2.

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Cet article a fait l'objet d'une évaluation externe.

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Although the literature supports the safety and low complication rates of vacuum-assisted births, no studies document outcomes and complications when family physicians operating autonomously use vacuum extraction. Reports of use of vacuum extraction come from settings where obstetricians or obstetric residents are the operators.¹⁻⁷

In Canada, national programs (eg, Advances in Labour and Risk Management [ALARM] and Advanced Life Support in Obstetrics [ALSO]) and family practice resident training programs teach the indications and techniques for use of vacuum extractors. These programs make the assumption that, if family physicians select cases carefully, they can be as safe as their obstetrician colleagues in use of vacuum extractors. But this assumption is not supported by any studies identifying outcomes of family physicians as sole operators in vacuum-assisted deliveries.

According to recommendations of the Maternity and Newborn Care Committee of the College of Family Physicians of Canada, family practitioners should organize themselves to take responsibility for their own practice.⁸ As individual family doctors have a range of skills and experience, it can be difficult to generalize about appropriate scope of practice. When adverse outcomes occur under specialist care, it is often assumed that they are inevitable, but when they happen under generalist care, the response is often to revoke privileges. It seems easier for those in charge to restrict the privileges of all family physicians than to organize appropriate risk management and quality improvement exercises that could enhance family physicians' skills and practice.

After a review of a single, complicated, low-station vacuum delivery involving a family physician, we began an audit. It was brought to the attention

of the Head of the Division of Family Practice Obstetrics that our hospital privileges allowed only outlet-station vacuum extractions by family physicians (even though most family practice department members were performing vacuum-assisted deliveries at low station as well).

When we attempted to bring a motion to our Medical Advisory Committee to expand basic family practice obstetric privileges to include low station, the departments of Obstetrics and Pediatrics raised concerns. They thought that cases referred to them after vacuum failures were more difficult to deliver and would lead to an increase in the rate of subgaleal hemorrhages and other neonatal complications.⁹⁻¹¹ Hence these departments were unwilling to support our motion.

In initiating our audit, we thought that the situation our family physicians faced might also be common in other large urban centres where obstetricians are readily available to provide support. Accordingly, we undertook a retrospective chart audit to help clarify family physicians' use of vacuum extraction. We tried to answer four questions. When a family physician used a vacuum extractor, how often was its outcome successful? According to station, what were the modes of delivery for vacuum extractions that failed? What complications did mothers and newborns have after vacuum extractions by family physicians? What effect did station and parity have on outcomes of vacuum extraction?

METHODS

Setting

The Kelowna General Hospital, a community hospital serving 130 000 people, has 1400 deliveries a year; 35 family physicians provide low-risk maternity care. Obstetricians and pediatricians are in the hospital only during the day. Family physicians manage their patients to the level of their expertise and consult only when warranted. The hospital is associated with the University of British Columbia's medical school and has a teaching program for family practice residents.

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Definitions

Family physicians at our hospital use a disposable soft-cup vacuum extractor, as described in the ALSO manual. Traction is applied only during contractions and halted when contractions are over. Pressure on the system is lowered when the contraction has subsided.¹² A failure is called when a delivery is not achieved after three “pop offs,” or no progress is made after three consecutive pulls with the contractions.

Station is defined using the terminology of the Maternal-Fetal Committee of the American College of Obstetricians and Gynecologists. Outlet station is when “the fetal skull has reached the pelvic floor and the scalp is visible between contractions. The sagittal suture is in the anterior-posterior diameter or in the right or left occiput anterior or posterior position, but not more than 45° from the midline”;¹² and low station is when “the leading edge of the fetal skull is station +2 cm or more and the head is not on the pelvic floor. Rotations are divided into 45° or less and more than 45°.”^{12,13}

Indications for using the vacuum extractor are as outlined in the ALSO manual and include inability to push (maternal exhaustion), failure to descend due to soft tissue resistance, malposition, and any conditions that require the birth of the fetus to be expedited during the second stage of labour, including non-reassuring fetal heart rate tracings.¹²

We conducted a retrospective case audit of the 4003 deliveries at the Kelowna General Hospital from April 1, 2000, to March 31, 2003. We reviewed (stratified by parity) success rates, modes of delivery after vacuum failure, complications, and station of vacuum-assisted deliveries.

Subjects

During the study period, 21 of 35 family physicians practising obstetrics did at least one vacuum extraction; all deliveries where a family physician attempted a vacuum extraction were included. An in-house audit of the 21 physicians doing vacuum deliveries showed that 14 had taken the ALSO course as training in use of the vacuum extractor. The other seven reported being trained in residency programs. All 21 physicians reported using

the ALSO manual as a reference for operating a vacuum extractor.

Data collection

We used all data that a specifically trained medical record abstractor retrieved from the data set of the Canadian Institute for Health Information adapted for Kelowna General Hospital.¹⁴ This is a standardized method for tabulating and classifying information on mothers, newborns, deliveries, and physicians attending births. Complications of mothers and newborns, parity, and station of application of the vacuum extractor were retrieved by the abstractor from the British Columbia Labour and Birth Summary Record, written obstetric consultations, or physicians' progress notes. Charts requiring clarification were reviewed by the study's principal investigator. Accuracy and reliability of the data were verified by an obstetrician's randomly pulling 10 charts for review.

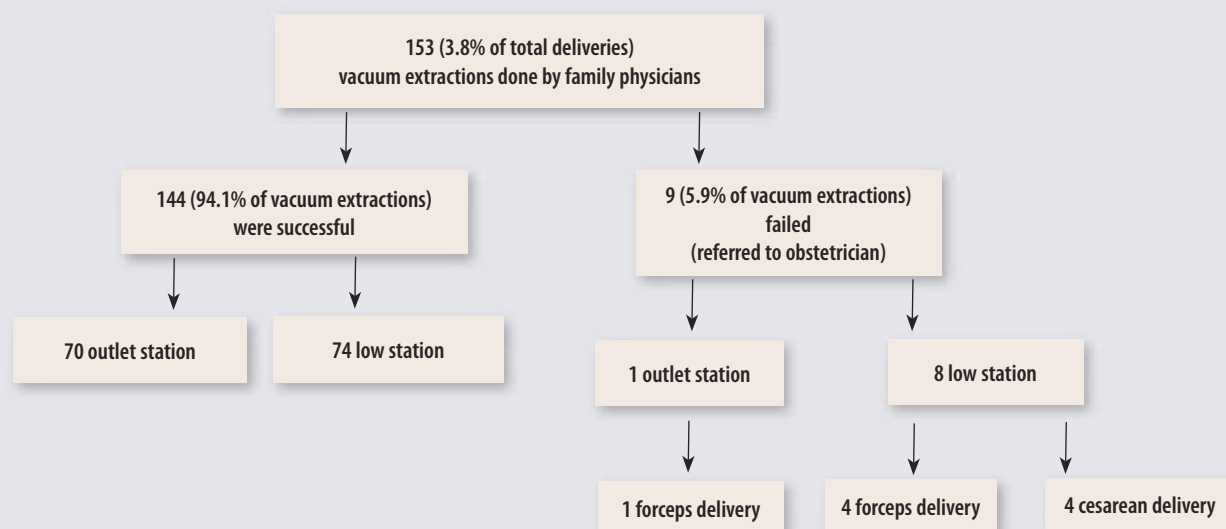
RESULTS

Of the 4003 deliveries at our hospital, 153 were vacuum extractions by family physicians. All 153 mothers (3.8% of total deliveries) were documented as singletons, cephalic presentations, and more than 35 weeks' gestation either by dates or ultrasound, and all newborns had a recorded birth weight >2500 g. Review of family practice vacuum-assisted deliveries revealed that 144 (94.1%) were successful, and that 82 were at low station and 71 at outlet station. The nine (5.9%) failed vacuum-assisted deliveries were all referred to obstetricians. Five of these nine patients had a trial of forceps; four were successful. Of the nine failed vacuums, eight were documented at low station. One failed forceps delivery went on to a cesarean delivery, as did the other four failed vacuum deliveries (**Figure 1**).

Complications of successful vacuum deliveries

No complications were documented for 115 mothers (80%). Complications for the other 29 mothers

Figure 1. Outcomes for vacuum extractions by family physicians: Total number of deliveries between April 1, 2000, and March 31, 2003 was 4003.



(20%) were postpartum hemorrhages (≥ 500 mL), 3° to 4° tears, fever, vulvovaginal hematomas, readmissions for postpartum hemorrhage, and complicated lacerations requiring obstetrician repair (Table 1).

Most newborns (131, 91%) had no complications. Thirteen newborns (9%) had cephalohematomas, fractured clavicles, or pneumothorax.

Table 1. Complications for mothers and babies

COMPLICATIONS	SUCCESSFUL VACUUM EXTRACTIONS	FAILED VACUUM EXTRACTIONS
MOTHERS*	29	4
Postpartum hemorrhage (≥ 500 mL)	21	4
Third- or fourth-degree tear	14	4
Complicated laceration	6	3
Vulvovaginal hematoma	1	0
Fever	1	0
Readmission	1	0
NEWBORNS	13	1
Subdural hematoma	0	1
Cephalohematoma	11	0
Fractured clavicle	1	0
Pneumothorax	1	0

*Some mothers had more than one complication.

There were no documented cases of subdural hematoma, subgaleal hemorrhage, retinal hemorrhage, or Apgar score below 7 at 5 minutes (Table 1).

Complications of failed vacuum deliveries

We also report outcomes of failed vacuum deliveries among mothers and babies referred to our obstetric consultants. Deliveries were ultimately by forceps or cesarean section. Forceps delivery after failed vacuum delivery was associated with the highest incidence of complications. One newborn had a subdural hematoma. This occurred when a family physician failed to deliver a nulliparous woman at low station by vacuum extraction and then referred her to an obstetric consultant, who failed with a repeat vacuum extraction and with a forceps delivery, and subsequently delivered the baby by cesarean section. As with successful vacuum extractions, no newborns had subgaleal hemorrhages, retinal hemorrhages, fractured clavicles, pneumothorax, cephalohematomas, or Apgar scores < 7 at 5 minutes.

Station and parity

We noted that 106 (69%) vacuum-assisted deliveries were among nulliparous women. More of these deliveries were at low station (82) than outlet station (71). Failures were most frequent at low station with nulliparous women (Table 2).

Table 2. Station and parity

PARITY	SUCCESSFUL		FAILED		TOTAL
	OUTLET STATION	LOW STATION	OUTLET STATION	LOW STATION	
Nulliparous	55	45	1	5	106
Multiparous	15	29	0	3	47

DISCUSSION

Our audit was unique in that it was based in family practice and at a community hospital. At our hospital, 6.5% of deliveries are vacuum assisted (similar to other reported rates^{1,4,7}); of these, 58.8% (153) were done by family physicians, the rest by obstetricians. Family physicians' success rate was 94.1%, well within the efficacy rates reviewed by O'Grady et al in specialist settings, which varied from a low of 73.1% to a high of 94.4%.⁷

We found that, when family physicians referred failed vacuum-assisted deliveries, the women were ultimately delivered by forceps and cesarean section almost equally. The one referred case where both vacuum and forceps failed and ultimate delivery was by cesarean, resulted in our most serious complication, a subdural hematoma. Subdural hematoma has previously been associated with multiple instrumental deliveries.¹⁵ Because our numbers were relatively small, it is unclear whether failed vacuum-assisted deliveries referred by family physicians to our obstetricians were more complicated to deliver or were followed by more complications.

The rate of complications among our mothers was 21.6% (33 mothers), similar to rates found in other studies.^{1,4,5,16} Our neonatal complication rate of 9.2% (14 newborns) was similar to rates reported in the literature for specialist settings.^{2,4,6,15-17} The 7.2% (11 of 153 deliveries) rate of cephalohematoma among family physicians' vacuum-assisted births was lower than rates reported in the literature,^{1,16,17} although the cephalohematoma rate of

13.4% (11 of 82 deliveries) at low station was similar to rates in the published literature.¹⁸

Many family physician vacuum-assisted deliveries (53.6%) were performed at a low rather than outlet station; 74/82 deliveries at low station were successful. High rates of vacuum extraction among nulliparous women have been reported and are supported by our findings.^{3,5,15} Our failed vacuum extractions occurred mainly among nulliparous women at low station.

Based on our findings, the hospital departments of Obstetrics and Pediatrics supported our request to expand qualified family physicians' privileges to include vacuum extractions at low station. We believe our findings support the premise that, when adverse outcomes occur, they should not be generalized beyond individual practitioners or events. An organized risk-management approach provides a framework for analysis of group and individual performance. To build on our understanding of outcomes of family practice maternity care, including use of vacuum extraction, we should continue studies at our hospital and at other comparable centres.

Limitations

This study had important limitations. As it was a retrospective chart audit, only adverse outcomes that were documented or searched for could be recorded. Our study did not have sufficient power to find rare but important adverse events. As well, we recognize that not all stations are documented accurately and that results cannot be extrapolated to use of other types of vacuum extractor. Also, our results can be generalized only to settings with obstetricians on site or available from home.

Conclusion

At Kelowna General Hospital, vacuum extractions by family physicians have a high rate of success and few complications. When vacuum delivery is anticipated at low station, this and nulliparity are associated with increased likelihood of failure. To date, family physicians who select cases carefully and

operate within accepted guidelines for vacuum use have not increased our hospital's rates of subgaleal hemorrhage or newborn complications. ❁

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Contributors

Dr Yarrow was principal investigator and maintained overall responsibility for the integrity of the work and the writing. Dr Benoit was part of the research group, assisted with data interpretation, and was involved in editing. Dr Klein provided advice on the structure of the analysis and contributed to writing and editing.

Competing interests

None declared

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EDITOR'S KEY POINTS

- This study describes outcomes of vacuum-assisted deliveries attended by family physicians in a community hospital in British Columbia.
- Of 153 vacuum-assisted births, 94% were successful. All nine failed vacuum-assisted deliveries were referred to obstetricians. Four babies were delivered by forceps; one forceps delivery failed. The remaining four deliveries, and the failed forceps delivery, were delivered by cesarean section.
- Overall, 22% of mothers and 9% of babies had complications, although most were not serious. Subdural hematoma occurred in the case where both vacuum delivery and forceps failed, and the baby was delivered by cesarean section.
- Nulliparity and low station were associated with failure of vacuum extraction.

POINTS DE REPÈRE DU RÉDACTEUR

- Cette étude rapporte les résultats d'accouchements pratiqués par des médecins de famille d'un hôpital communautaire de Colombie-Britannique et dans lesquels une ventouse obstétricale avait été utilisée.
- Sur 153 de ces accouchements, 94% étaient des réussites. Les neuf échecs ont tous été dirigés à des obstétriciens. Dans quatre de ces cas, on a dû recourir aux forceps, une fois sans succès. Dans ce dernier cas et dans les quatre autres échecs, une césarienne a été pratiquée.
- Des complications sont survenues chez 22% des mères et 9% des bébés, la plupart sans gravité. Un bébé accouché par césarienne à la suite d'échecs successifs de la ventouse et des forceps a présenté un hématome sous-dural.
- Les échecs d'extraction semblent plus fréquents chez les nullipares et à la station plus 2.

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