

## Outcome following introduction of a procedure specific pain management programme for caesarean section

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Based on the results of a prospective audit conducted in 2014 among 310 post caesarean section patients (Group A) at Tuen Mun Hospital, Hong Kong, a procedure specific postoperative pain management programme was implemented. To complete the audit cycle, a second prospective audit was conducted in 2015 among 332 patients (Group B). The proportion of patients with severe pain (VAS $\geq$ 7/10) reduced significantly from 55.5% (Group A) to 23.0% (Group B) ( $p<0.001$ ). In Group A, 8% of patients were dissatisfied with the pain relief and this figure dropped significantly to 0.7% after the introduction of the pain management programme ( $p<0.001$ ). Significantly larger number of patients received preoperative information. (19.5% in Group A vs. 64.7% in Group B,  $p<0.001$ ). Percentage of patients having pain assessment and reassessment by ward nurses also significantly increased. ( $p<0.001$ ). In Group B, we managed to enforce a more consistent implementation of evidence-based best practice in our Obstetric unit and decrease the variability of anaesthetic practice. Our findings show that a postoperative pain management programme designed in an evidence-based procedure specific manner can reduce postoperative pain and improve patient satisfaction.

**Keywords:** procedure specific; post-operative pain programme; obstetric; audit; pain score; patient satisfaction

### Introduction

Post caesarean section (CS) patients usually suffer from moderate to severe pain postoperatively. Traditionally opioid is used for analgesia. However opioid use is associated with many side effects and long term problems, e.g. dependence, drug abuse. The Joint Commission<sup>1</sup>, recognizing the potential danger of opioid use, issued a Sentinel Event Alert and made recommendations on the safe use of opioids, including the use of multimodal analgesia. Multimodal analgesia is the combination of different classes of analgesics in optimal dosages that maximize efficacy and minimize side effects. So far published meta-analyses focused on the combination of two analgesics<sup>2,3,4,5</sup> which do not fully reflect our common practice of using 3 or

more analgesics. Moreover, the data is not procedure specific. Since we now have evidence to suggest that the efficacy of analgesic agents differ in different surgical settings<sup>6</sup>, further studies are needed to prove its effectiveness.

Postoperative pain therapy should be procedure specific for several reasons. Firstly, the nature of surgery influences the type, location, intensity and duration of pain. Secondly, the efficacy of different analgesics differs between different procedures.<sup>6</sup> Thirdly, the risks of analgesic techniques should balance against the benefits of pain therapy outcomes and this risk to benefit ratio depends on the type of procedure (e.g. Epidural analgesia offers complete analgesia after CS; however, its use is associated with motor impairment and urinary retention which affect breastfeeding and rehabilitation). Fourthly pain assessment should be procedure specific. (e.g. In classical incision for CS, assessing dynamic pain score during coughing is important as inadequate pain relief could lead to cardiopulmonary complications).

Tuen Mun Hospital (TMH) is the largest regional hospital in the New Territories West Cluster (NTWC) in Hong Kong. We have more than 5500 deliveries a year and the rate of caesarean section

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is about 27%. As part of the Quality Improvement Program, we introduced procedure specific pain management programme (PSPMP) in 2015 and evaluated its effectiveness by performing audits.

**Methods**

This prospective survey was conducted in the postpartum obstetric ward. Our institutional ethics committee was consulted and this project was approved as a quality assurance activity. Patients were followed up by pain nurses during work days in the 3 months review period. Two structured questionnaires were designed. One to be filled on postoperative day 1 to collect patient information, the type of analgesics that were prescribed and pain score in the first 24hrs. The second one was filled on postoperative day 2 or 3 to assess the overall pain management service. Baseline survey was performed from October 2014 to December 2014. (Group A). PSPMP was introduced in stages from January 2015 and a second survey was performed from August 2015 to November 2015 (Group B). PSPMP was designed based on the characteristics of post CS pain and evidence-based practice and it included:

1. Spinal morphine<sup>7</sup> was administered where possible.
2. Pethidine use was abandoned. Morphine became the strong opioid of choice.
3. Regular and pro re nata (prn) analgesics were prescribed (Table 1)

**Table 1:** Procedure specific analgesic regimen

	Regional anaesthesia (RA)	General anaesthesia (GA)
Before wound closure	Nil	Surgical transversus abdominis plane block
Immediately after operation	Rectal diclofenac <sup>8</sup> 100mg	Rectal diclofenac 100mg
Day 0 regular analgesic	Oral or rectal paracetamol	Oral or rectal paracetamol
Day 1 and 2 regular analgesic	Oral paracetamol 1 g tds Oral diclofenac SR 100mg nocte	Oral paracetamol 1g tds Oral diclofenac SR 100mg nocte
Day 0 to 2 prn analgesic	Oral tramadol 50mg Q4H	Oral tramadol 50mg Q4H or IMI morphine 7.5 to 10mg Q4H if nil per os (NPO)

*Note: Diclofenac is omitted if it is contraindicated. Patient controlled analgesia (PCA) is encouraged if the patient has severe pain in the postoperative period.*

4. Surgical transversus abdominis plane block (sTAP) would be performed in the GA group. We standardised the technique for sTAP.<sup>9</sup> Surgeon used a standardised blunt tip needle (B Braun Plexifix 24G 2 inch needle with Luer lock) to reach the correct muscle plane. A total of 40ml of 0.25% plain bupivacaine was injected.
5. Nurses were educated on the safe use of PCA in June 2015. Rest pain and dynamic pain had to be recorded. Pain was reassessed in case of severe pain (pain score of seven or above on a numerical 11-point rating scale: 0=no pain; 10=maximal pain imaginable) or after breakthrough pain medication was administered.
6. Structured patient education in the form of patient information pamphlet was introduced in June 2015.

The set goals<sup>10</sup> are shown in table 2.

**Table 2:** Set goals for the audit

1	Less than 20% of patients have a pain score $\geq 7/10$
2	>90% patients are satisfied with the service
3	>90% elective patients receive preoperative information on pain management
4	Postoperative pain assessment on >90% patients
5	Pain reassessment on >80% patients
6	100% patients are prescribed with regular non-steroidal anti-inflammatory agent if there are no contraindications
7	100% patients receive spinal morphine if there are no contraindications

**Measurement of results and statistics**

The outcome measures include pain intensity, side effects of analgesia, patients’ satisfaction. The collected data was presented as median with interquartile range (IQR) or frequency with percentage. Continuous variables were compared using the Mann-Whitney U test, categorical variables were analysed using the Chi-square test or Fisher’s exact test where appropriate. Logistic regression was used to analyse factors influencing patient satisfaction. All statistical analyses were done using IBM SPSS 21.

**Results (Table 3)**

In Group A and B, there was no significant difference in the American Society of Anaesthesiologists (ASA) physical status and the

number of patients undergoing GA or RA. The percentage of patients undergoing emergency caesarean section in Group B was slightly higher than that in Group A (64.2% in Group B versus 50.8% in Group A, p=0.001).

**Table 3:** Patients' data

	Group A	Group B	p-value
ASA 1	224 (73.0%)	227 (68.4%)	0.338
ASA 2	75 (24.4%)	98 (29.5%)	
ASA 3	8 (2.6%)	7 (2.1%)	
Emergency	156 (50.8%)	213 (64.2%)	0.001
Elective	151 (49.2%)	119 (35.8%)	
GA	41 (13.4%)	45 (13.6%)	0.941
RA	266 (86.6%)	287 (86.4%)	

**A. Pain level and procedure specific pain protocol**

*1. Standardise the use of regular analgesics with prn analgesic*

One alarming finding in Group A was that the majority of patients did not receive regular analgesics postoperatively (2.9% had regular analgesics in Group A as compared to 99.1% in Group B, p<0.001). In Group A, only 9 patients were prescribed with regular analgesic. 100% had prn medication, including paracetamol, diclofenac, tramadol, pethidine and morphine.

*2. Standardise the use of spinal morphine*

In Group A, about 11.2% of patients received fentanyl. Since no regular analgesics were administered postoperatively, the worst 24hr visual analogue scale (VAS) was 7 (IQR: 5-8). 55.5% of patients had severe pain (VAS>=7). In Group B, the worst 24hr VAS became 5 (IQR: 3-6) and patients with severe pain dropped to 23.0%.

*3. Standardise the use of sTAP*

In Group A, some patients had local wound infiltration after GA. In Group B, 84.4% of patients with GA had sTAP. For those with severe pain, we encouraged the use of PCA. Out of 45 patients with GA, only 2 had PCA. The percentage of patients with severe pain on day 0 dropped from 70.7% (Group A) to 22.2% (Group B) (p<0.001). (Table 4)

**Table 4:** Summary of the results

	Group A	Group B	P-value
Worst VAS>=7/10 in the first 24hr postoperatively (%)	55.5% (70.7% in GA; 53% in RA) (n=310)	23.0% (22.2% in GA; 23.1% in RA) (n=332)	<0.001
Worst VAS>=7/10 assessed on Day 2 or 3 (%)	35.1% (n=195)	19.1% (n=234)	<0.001
Patient satisfaction on pain management (%)	(n=225)	(n=298)	
Not satisfied	8%	0.7%	<0.001
Fairly satisfied	24.9%	9.1%	
Satisfied	66.2%	79.5%	
Very satisfied	0.9%	10.7%	
Preoperative information (%)	19.5% (n=226)	64.7% (n=300)	<0.001
First 24hr pain assessment (%)	57.3% (n=227)	84.6% (n=299)	<0.001
Pain reassessment (%)	23.0% (n=217)	61.3% (n=292)	<0.001
Response time for prn analgesia	(n=206)	(n=260)	
<15minutes	64.1%	52.3%	0.054
<30minutes	17.0%	24.6%	
<45 minutes	6.8%	10.4%	
>60minutes	12.1%	12.7%	
Effectiveness of pain management	(n=221)	(n=299)	
Not effective	10.9%	1%	<0.001
Partly effective	38.0%	16.7%	
Effective	48.9%	76.3%	
Very effective	2.3%	6.0%	
Whether staff tried best to help	(n=226)	(n=299)	
Agree	27%	47.5%	<0.001
Partly agree	54.9%	50.5%	
Disagree	18.1%	2.0%	
% of patients who felt improvement of pain service was necessary	(n=225)	(n=296)	0.004
Regular diclofenac on day 1(%)	1.0% (all patients)	96.9% (no contraindications)	
Spinal morphine 0.15mg (%)	88.6%	99.3%	<0.001

*4. Factors demonstrating correlation with the Pain score (VAS)*

In Group A, 2 factors showed significant correlation with the first 24hr VAS, namely whether CS was done under GA or RA (p=0.034; lower VAS in the RA group) and whether pain assessment was done (p=0.031; lower VAS in the pain assessed group). In Group B, lower first 24hr VAS was correlated with 4 factors, namely

1. When reassessment was performed (p=0.008)

2. When diclofenac suppository was given in the immediate postoperative period (p=0.003)
3. When prn rescue analgesics was given at times of severe pain (p<0.001)
4. When the patient thought that improvement of pain service was not needed (p=0.002)

When the effect of spinal morphine faded after the first 24hrs, the worst 24hr VAS recorded on day 2 or 3 was 5 (IQR: 4-7) in Group A and 4 (IQR: 2-6) in Group B (p<0.001). Patients with severe pain dropped from 35.1% in Group A to 19.1% in Group B (p<0.001). The first set goal was achieved one day after CS.

In Group A, the only factor that had significant correlation with VAS on day 2 and 3 was patient satisfaction (p=0.001). In Group B, lower VAS on day 2 or 3 was correlated with 3 factors, namely:

1. Short waiting time for the rescue analgesics (p=0.016)
2. Patient satisfaction (p=0.037)
3. When patient thought improvement in the pain service was not needed (p<0.001)

**B. Patient Satisfaction**

In Group A, there are six factors correlating with patient dissatisfaction in univariate analysis, namely,

1. Long response time for prn analgesia (p<0.001)
2. Severe pain 24hrs after surgery (p=0.001)
3. No pain assessment (p=0.008).
4. Patient thought pain management was ineffective (p<0.001).
5. Patient thought that staff was not trying their best to help (p=0.001).
6. Patient thought that improvement of pain service was needed (p<0.001).

With significant improvement in parameters 2 to 6 (Table 4), the second set goal was achieved in Group B.

**C. Analgesia related side effects (Table 5)**

Overall, there was no significant difference in the incidence of side effects in Group A and B (p=0.339). When looking into subgroups, the incidence of pruritus was slightly increased in Group B (p<0.001). This increase was expected because more patients now received spinal morphine (88.5% of patients had spinal morphine in Group A versus 99.3% in Group B).

**Table 5: Side effects of pain therapy**

	Group A N (%)	Group B N (%)	P-value
Overall side effects			
No	170 (67.5%)	192 (63.6%)	0.339
Yes	82 (32.5%)	110 (36.4%)	
Nausea			
No	242 (96.4%)	291 (96.4%)	0.561
Mild	9 (3.6%)	9 (3.0%)	
Moderate	0 (0%)	2 (0.7%)	
Vomiting			
No	240 (95.6%)	293 (97.0%)	0.160
Mild	11 (4.4%)	7 (2.3%)	
Moderate	0 (0%)	2 (0.7%)	
Dizziness			
No	230 (91.6%)	278 (92.4%)	0.952
Mild	19 (7.6%)	21 (7.0%)	
Moderate	2 (0.8%)	2 (0.7%)	
Pruritus			
No	219 (87.6%)	222 (73.5%)	<0.001
Mild	29 (11.6%)	69 (22.8%)	
Moderate	2 (0.8%)	11 (3.6%)	
Backache			
No	233 (99.1%)	295 (99.0%)	1.000
Yes	2 (0.9%)	3 (1.0%)	

**Discussion**

An ideal perioperative pain programme should be evidence-based, procedure specific and cost effective.

Principles behind the design of PSPMP

*a) Multimodal analgesia administered at regular intervals with prn analgesics*

The key concept of 1986 WHO<sup>11</sup> analgesic ladder is by mouth, by the clock, by the ladder and for the individual. Paracetamol and non-steroidal anti-inflammatory agents (NSAID) are good at treating mild to moderate pain. Opioid should be the next step for patients with moderate to severe pain. The route of administration should be appropriate and should be administered orally wherever possible. Regular analgesics should be given.

Apart from treating pain according to its pain intensity, it is wise to match the analgesic with the underlying pain pathophysiology, e.g. NSAID reduces visceral pain originating from the uterus and complements the somatic wound pain relief from the opioid. It is opioid sparing and limits the opioid related adverse effects. Multimodal therapy should always be considered instead of using stepwise increase in a single analgesic.

The use of RA wherever possible is now the standard anaesthetic care in CS. Survey showed that RA was increasingly used for elective CS from 32% in 1982<sup>12</sup> to 91% in

2000<sup>13</sup> and this trend may be responsible for the decline in maternal mortality due to anaesthesia, from 7.2 (1982-1984 report)<sup>14</sup> to 3 deaths per million maternities (2000-2002 report)<sup>15</sup>.

Apart from giving multimodal analgesia at a regular interval, prn medication for breakthrough pain is required to address the transient flare of pain on top of background pain. After optimizing the background analgesia, prn analgesics could provide a better dynamic pain relief and may facilitate early mobilization and rehabilitation.

#### *b) Some non-opioid analgesic adjuncts*

Preoperative 600mg gabapentin reduces post CS pain on movement at 24hrs but may result in severe sedation<sup>16</sup>. Neuraxial neostigmine and clonidine enhance postoperative analgesia. Side effects include prolonged motor blockade, nausea and vomiting in neostigmine use<sup>17</sup> and unacceptable hypotension, sedation, bradycardia, vomiting and prolonged motor block<sup>18</sup> in clonidine use. Dexamethasone (1.25 -20mg)<sup>19</sup> had been shown to decrease VAS at 24hrs, decrease pain on movement and decrease morphine consumption, decrease nausea and vomiting without increasing the rate of infection. Postoperative hyperglycemia may occur. Although these adjuvants showed promising results, they were not considered in our analgesic regime because of the side effects.

Regional block, for instance, TAP has opioid sparing effect. One study showed that TAP together with intrathecal opioid did not improve the outcome as compared to using intrathecal opioid alone.<sup>20</sup> So TAP is considered only in GA group or when spinal morphine is contraindicated.

We did encounter some resistance during the change in practice. We identified in Group A that 18.4% of patients were prescribed with prn pethidine. Pethidine during breastfeeding was not recommended because norpethidine would accumulate in breast milk with repeated use and had a low neonatal elimination. Finally, the team agreed on the change. Performing sTAP was another hurdle. Our team gained the consensus that it could save time if surgeon performs sTAP. In addition, sTAP could help to extend

anaesthesia time in case when operation is long and spinal anaesthesia wears off.

There are some limitations. First of all, this is a sequential survey. The patients are not randomised and the observers cannot be blinded. Secondly, there are some missing data in both surveys, especially the second questionnaire. We managed to decrease the missing data in Group B from 37% to 29.5%.

#### **Conclusion**

With team effort, we managed to obtain more than 50% reduction in patients with severe pain in the first 24hrs and a positive increase in patient satisfaction. There is still room for improvement. 23% of post CS patients still had severe pain and 0.7% of patients were dissatisfied with the pain service in Group B. To sum up, pain management protocol should be procedure specific and multidisciplinary teamwork ensures its success.

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#### *Declaration of interest*

None declared.

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