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Maternal request CS—Role of hospital teaching status and for-profit ownership

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Abstract

Objective: To examine whether hospitals' for-profit (FP) ownership and non-teaching status are associated with greater likelihood of maternal request cesarean (CS) relative to public and not-for-profit (NFP) and teaching status, respectively.
Method: Retrospective, cross-sectional, population-based study of Taiwan's National Health Insurance claims data, covering all 739,531 vaginal delivery-eligible singleton deliveries during 1997–2000, using multiple logistic regression analyses.
Results: Adjusted for maternal age and geographic location, FP district hospitals (almost all non-teaching), followed by ob/gyn clinics were significantly more likely to perform request CS (OR = 3.5–2.3) than public and NFP teaching hospitals. Among non-teaching and teaching hospitals, FPs were more likely to perform request CS than public and NFP hospitals (OR = 2.3 and 2.5, respectively).
Conclusions: Our findings are consistent with greater propensity of physicians in FP institutions to accommodate patient requests involving revenue-maximizing procedures such as request CS. This effect is moderated by teaching hospitals' preference for complicated cases, consistent with their teaching mission and hi-tech infrastructure.

Keywords: Request cesarean section; Hospital ownership; Teaching status

1. Introduction

Unprecedented cesarean section (CS) rates are being documented with parts of the developing world (Taiwan 32.5% [1], Chile 40% [2] and most other Latin American countries [2]) exceeding the rates of developed countries (US 24.4% [3] and England 22.0% [4]). Many authors report that maternal preference for cesarean delivery is an increasingly significant factor in rising CS rates [5,6].

Studies on request CS can be classified into qualitative surveys of physicians and patients and data-driven studies using secondary data. A survey showed that 61.9% of obstetricians in the North Thames region of the United Kingdom felt that maternal request significantly contributed to increasing CS rates [7]. At the Watford General Hospital in UK maternal request was the reason for 38% of all elective CS in 1995–96 [8] and at Chelsea and Westminster Hospital, for 72% of elective CS in 1999 [9]. In Italy, maternal request CS as a percent of all CS jumped from 3.6% in 1997 to 9% in 2000 [10]. In Norway, maternal request accounted for 7.6% of all CSs [11].

Request CS in the absence of clinical need has drawn much discussion, driven by clinical, ethical and legal perspectives. Yet, little is known about the influence of physicians and the institutional setting, because of the delicate issues in isolating women's personal choice from their physicians' or institutional preferences. Turnbull et al. reported that over a third of women were not consulted in the CS decision-making process [12]. Kirk et al. found that physicians' attitudes toward vaginal birth after cesarean (VBAC) influences women's mode of delivery [13]. Hemminki observed that obstetricians' preference for CS

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might facilitate increasing patient demands for abdominal delivery [14]. Collectively, these authors suggest that women's CS choice may be influenced by their physicians' preferences.

One empirical approach would be to look for systematic variations in maternal request CS rates by institutional characteristics such as ownership and hospital level. This study examines these factors, using 4-year population-based data (1997–2000) from Taiwan's National Health Insurance (NHI) database. Over 98% of all 23 million plus citizens of Taiwan are covered by NHI, which is funded by employee, employer and government contributions. NHI provides comprehensive health coverage, requiring low co-payments that are waived for low-income individuals. For all others, the rate is fixed regardless of socio-economic status. Patients have full choice of providers, which could be public, not-for-profit (NFP) or for-profit hospitals (FP), or ob/gyn clinics (also FP), all geographically well dispersed throughout the country.

This study contributes to the international literature on the factors driving high CS rates in a universal-access health system, with a mix of public and private providers. Such studies can provide direction for public policies geared toward appropriate obstetric care, consistent with optimum maternal and fetal outcomes. Empirical studies have suggested that reductions in CS rates among high CS-rate populations do not adversely impact maternal or fetal outcomes and therefore may be cost-effective without concurrent loss of health benefits [6,15]. Goer's exhaustive literature review (of 69 studies) indicates that elective cesarean delivery in the absence of clinical indications has no discernable benefit, while causing short-term and long-term adverse impacts in many cases [16]. Therefore, empirical studies on maternal request CS have policy implications. Our study also contributes to cross-country comparisons and is relevant to the international debate on maternal cesarean preferences and to the role of the private sector and market mechanisms in health care.

1.1. Study setting and hypotheses

We hypothesize two institutional effects on request CS, ownership (FP, NFP and public) and hospital teaching status (large teaching hospitals versus small non-teaching hospitals). Our hypotheses are based on the tenets of the property rights theory, moderated by the educational mission of teaching hospitals. The property rights theory states that FP institutions strive to maximize profits, because managers and owners can gain from profits, unlike NFPs and public institutions [17]. Thus, FP hospital behavior may involve a selection process among alternative revenue generation opportunities, to choose revenue maximizing options that are consistent with other core objectives such as their teaching mission.

Teaching FP hospitals (medical centers and regional hospitals) possess superior diagnostic and treatment capabilities compared to district hospitals and clinics. These hospitals may prefer to use their core infrastructure of beds and personnel for diagnoses requiring hi-tech care, which would satisfy two core concerns, financial and teaching objectives. Because hi-tech care is more intensive and generates greater revenue per bed-day, FP teaching hospitals may prefer to admit cases requiring hi-tech care (rather than low-tech procedures, e.g. CS), to realize better returns on their core fixed costs. Further, their teaching mission obligates them to provide students and residents with clinical learning opportunities, which generates an explicit priority to admit complicated cases requiring detailed case work-up, investigations and complex treatments. In contrast, less equipped FP hospitals [18,19], which lack hi-tech revenue-generation opportunities and a teaching mission, may opt to utilize their core infrastructure for low-tech, low-risk, revenue-maximizing procedures, such as elective CS. Therefore, although request CS may be a patient-initiated decision, physicians at lower levels of FP institutions may readily accede to patients' CS requests, without much persistence to dissuade them through professional counseling. If this is the case, then the empirical evidence should show increased likelihood of maternal request CS at lower level FP hospitals. Higher CS rates among privately owned lower level institutions compared to higher level institutions is documented by Lallo et al. in Italy [20].

We use pooled, 4-year population-based data to test the following hypotheses:

1. For-profit (FP) hospitals will show greater likelihood of request CS that yields higher revenues, relative to low-revenue procedures (vaginal delivery), compared to public and NFP institutions.
2. Lower level (smaller, non-teaching) hospitals will be more likely to provide request CS relative to higher level (larger, teaching) hospitals.

2. Methods

2.1. Data sources

The data source for the study is the Bureau of NHI (BNHI) inpatient claims database, which includes detailed information on every medical encounter in Taiwan, except for the occasional consultation with physicians who are not contracted by NHI. There are very few practising physicians and hospitals that are not contracted by NHI. Each claim provides information on one primary and up to four secondary diagnoses, the procedure code, details of services and medications, institution type and some demographic information on the attending physician and patient.

We selected all singleton deliveries that were clinically eligible for vaginal delivery during 1997–2000, bearing a DRG code 0373A, vaginal delivery and 0373B, request CS.

The NHI reimburses request CS and vaginal delivery at the same rate and the provider has to bill the patient for the difference. Medically necessary CS, 0371A is reimbursed at twice the rate of vaginal delivery. All 0371A cases were excluded from the study, because by definition, CS was determined to be medically necessary in these cases. The remaining patients are considered clinically eligible for vaginal delivery. Of these, 0373B cases were delivered by cesarean at request. The vaginal delivery group includes both uncomplicated and instrumental deliveries.

Table 1 presents the distribution of total deliveries during 1997–2000 (total 1,078,600 cases) by type of secondary diagnoses and delivery type. The table illustrates the justification for selecting 739,531 patients who were eligible for vaginal delivery into the study sample. It should be noted that the study sample excludes 862 request CS cases with a significant obstetric diagnosis that could clinically justify CS as per the current state-of-art. To clarify the clinical status of the "vaginal delivery-eligibles," Appendix A shows the distribution of those request CS cases among the study sample that had any secondary diagnosis (4365 cases). Table 1 and Appendix A clarify that our study sample indeed isolates women with no clinical reason for a cesarean. The final study sample comprises a total of 739,531 cases during the study period that were determined to be vaginal-delivery eligible, 17,524 request CS and 722,007 vaginal delivery cases.

2.2. Variable definition and statistical methods

Bivariate and regression analyses in SAS were used. The dependent variable was dichotomous, whether or not a request CS was performed (request CS = 1, vaginal delivery = 0). Multiple logistic regression analysis was used to determine the effect of institutional ownership and level (bed capacity and teaching status) on request CS likelihood, controlling for patient's age and geographic location. Ownership was classified as public, FP and NFP. Hospital level represents teaching status and bed capacity (medical centers, MC with >500 beds, regional hospitals, RH with 250–499 beds, district hospitals, DH with 20–249 beds and ob/gyn clinics with less than 10 beds).

All MCs and RHs are teaching hospitals, as also a few DHs. Teaching hospitals which are mostly large tend to have salaried physicians, except for the consultants who are compensated on a per-case basis. These hospitals also have an array of nursing personnel, teaching and non-teaching, besides medical students, residents, nursing trainees and others. Due to a law that requires all deliveries to be attended by a qualified physician, midwives cannot take the lead in conducting deliveries in Taiwan, even uncomplicated vaginal delivery. Large hospitals employ nurse midwives whose major role is to assist in monitoring the course of labor, provide emotional support to the mother and assist during delivery. Because they cannot be utilized as a substitute to physicians, midwives are not necessarily hired as labor room personnel at all institutions.

Patients are free to choose any hospital or clinic for their delivery. Generally women remain attached to one physician from the beginning of the pregnancy up to childbirth and often during successive pregnancies. Physicians cannot admit patients to any hospital other then the one to which they are attached. Hospital physicians see their outpatients in the outpatient department. Clinic physicians cannot be attached to any hospital and have to admit and provide delivery services within their own facility. In the occasional case that the clinic or lower level hospital refers to the higher level institution, the referring physician no longer has attending privileges or input into the patient's care decision. Most often, referred patients are lost to the referral hospital. Since there is intense competition for patients, providers, especially clinics rarely refer patients, except under serious circumstances.

All MCs and most RHs are public or NFP. Most DHs and ob/gyn clinics are FPs, owned by a physician or group of physicians. Due to collinearity between ownership and

Table 1
Distribution of singleton delivery cases in Taiwan 1997–2000 (n = 1,078,600 cases)

	DRG 0371A Physician-decided CS	DRG 0373B Maternal request CS	DRG 0373A Vaginal delivery
Total deliveries	338,207	18,386	722,007
Secondary diagnosis			
(1) Previous CS	132,444	862[a] with previous CS, breech, dystocia or fetal distress	2,802
(2) Breech/dystocia/fetal distress	156,748		9,859
(3) Other complications justifying CS[b]	33,996		57,364
(4) Incidental co-morbidities[c]	13,740	4,365	20,915
(5) Pelvic floor/birth canal injury	60		88,477
(6) No secondary diagnosis[d]	1219	13,159	542,590
Total study sample		17,524[a]	722,007

[a] These cases are excluded from the study because DRG coding as 0373B could be an error, because the secondary diagnosis is a potential clinical indication for CS.
[b] Complications justifying a CS decision.
[c] Incidental secondary diagnosis without obstetric relevance for a CS decision, as per current state of art. Conditions included are shown in Appendix A.
[d] No secondary obstetric or medical diagnosis related to delivery.

Table 2
Distribution of sample patients by delivery type and institutional/patient characteristics ($n = 739,531$)

Variable	*VD-eligible*	VD	Request CS (percent of total)	*p*-Value
Institutional characteristics				
Hospital level (# of institutions)				0.001
Medical center	117,016	114,707	2309 (2.0)	
Regional hospital	159,931	156,528	2403 (1.5)	
District hospital	204,041	198,270	5771 (2.8)	
Ob/gyn clinic	260,405	252,502	7903 (3.0)	
Ownership				0.001
Public	79,826	78,524	1302 (1.6)	
Private not-for-profit	219,490	215,650	3840 (1.8)	
Private for-profit	441,077	427,833	13,244 (3.0)	
Geographic location				0.001
Northern	326,617	315,384	11,233 (3.4)	
Central	200,270	196,389	3881 (1.9)	
Southern	194,460	191,380	3070 (1.6)	
Eastern	19,046	18,844	202 (1.1)	
Teaching status				0.001
Yes	349,160	342,404	6756 (1.9)	
No	391,233	379,603	11,630 (3.0)	
Patient characteristics				
Age				0.001
<25	133,530	130,796	2734 (2.1)	
25–34	506,350	494,394	11,956 (2.4)	
>34	100,513	96,817	3696 (3.7)	
Age (mean ± S.D.)	29.2 ± 5.1	29.1 ± 5.2	30.1 ± 5.4	

CS, cesarean section; VD, vaginal delivery.

hospital teaching status, the institution variable is operationalized as Public MC, NFP MC, Public RH, NFP RH, FP RH, Public DH, NFP DH, FP DH and ob/gyn clinic (all FP). There are no FP MCs in Taiwan. We also controlled for maternal age (<25, 25–34 and >34 years). No information on maternal education or income is available in the dataset. A significance level of $p < 0.05$ was used.

3. Results

Table 2 shows the sample distribution (739,531 cases) by delivery mode, institution type and patient's age and Table 3 shows the bivariate distribution of institutions by ownership and level. Table 4 presents the results of multiple logistic regression analysis, showing that among teaching hospitals, FP RHs are slightly more likely than NFP and public teaching hospitals (MCs and RHs) to provide request CS. (The differences are statistically significant, all $p < 0.001$.) Overall, teaching institutions are about half as likely as clinics to provide request CS. (Table 4 shows odds ratios

Table 3
Distribution of healthcare institutions by ownership and level

Hospital level	Hospital ownership			
	Public	Private NFP	Private FP	Total
Medical center	7	12	0	19
Regional hospital	26	30	15	71
District hospital	40	22	193	255
Ob/gyn clinic	0	0	597	597
Total	73	64	805	942

Table 4
Logistic regression analysis results showing associations between institutional category[a] and the likelihood of requested CS ($n = 739, 531$)

Variable	Odds ratio (95% CI)	*p*-Value
Hospital ownership and level		
Public MC	0.4 (0.4–0.5)	<0.001
NFP MC	0.6 (0.6–0.6)	<0.001
Public RH	0.4 (0.4–0.5)	<0.001
NFP RH	0.4 (0.4–0.4)	<0.001
FP RH	0.6 (0.5–0.6)	<0.001
Public DH	0.6 (0.6–0.7)	<0.001
NFP DH	0.6 (0.6–0.7)	<0.001
FP DH	1.4 (1.4–1.5)	<0.001
Clinic (ref. group)		
Geographic location		
North (ref. group)		
Central	0.4 (0.5–0.6)	<0.001
South	0.4 (0.4–0.5)	<0.001
East	0.3 (0.3–0.4)	<0.001
Maternal age (years)		
<25	0.8 (0.8–0.9)	<0.001
25–34		
>34 (ref. group)	2.0 (1.8–2.0)	<0.001

NFP, not-for-profit; FP, for-profit; OR, odd ratio; CI, confidence interval.
[a] Teaching status is not included in the regression due to high collinearity with hospital level. All medical centers and regional hospitals are teaching hospitals.

ranging between 0.4 and 0.6 for MCs and RHs of all ownership types, with clinics as the reference group. This indicates that teaching institutions in general, have about half the request CS likelihood as clinics.) Within FP hospitals, teaching institutions (RHs) are significantly less likely than non-teaching, district hospitals, to perform request CS (OR = 0.4; 0.6/1.4).

Among lower level institutions, i.e. DHs (mostly non-teaching) and clinics, public and NFP DHs are about half as likely (OR = 0.6) as clinics to provide request CS. In comparison, FP DHs are about one and a half times as likely as ob/gyn clinics (OR = 1.4) and about two and a half times as likely as NFPs to provide request CS (OR = 2.3; i.e. 1.4/0.6). Overall, among lower level institutions, FPs (DHs and clinics) are more likely to provide request CS compared to public and NFP DHs. Within FPs, DHs have the highest request CS likelihood. Across all institutional categories, two summary observations can be made. First, teaching institutions are less likely than non-teaching institutions to provide request CS, although the confounding effect of hospital size cannot be separated within these data. (All large institutions with >250 beds are teaching institutions.) Second, within both the teaching and non-teaching categories, FP ownership is associated with significantly higher CS likelihood. Considering that none of the medical centers are for-profit and that all of the ob/gyn clinics are for-profit, we repeated the analysis after excluding all (377,421) deliveries that took place at medical centers and ob/gyn clinics and found that the pattern of associations remains unchanged and odds ratios almost identical (table not presented).

Geographic location also shows significant association with CS likelihood. Northern Taiwan, where Taipei, the largest and capital city is located has 2.5–3.3 times the likelihood of request CS as the rest of Taiwan. As expected, increasing maternal age is associated with increasing likelihood of request CS [21].

4. Discussion

Our findings empirically confirm that ‘‘maternal choice’’ of cesarean delivery is systematically associated with institutional setting. The pattern of odds ratios supports both our hypotheses. We believe that these findings have universal significance for policy makers concerned about increasing cesarean rates, because our findings come from national population-based data, covering every delivery, under stable reimbursement policies and a stable regulatory environment.

Our findings should readily generalize to countries such as the United States, having a mix of public, private and not-for-profit providers. Past authors have not been able to conclusively infer the role of institutional ownership, due to variations in patients’ insurance status and health plan types in most countries and lack of nation-wide (or even community-wide) electronic data pooling of patient data. Because of Taiwan’s system of universal healthcare access with low co-payments and coverage by a single payer system, it is possible to empirically verify the role of ownership and teaching status. If ownership, revenue and patient satisfaction considerations affect provider behavior similarly throughout the world, then our findings have policy relevance internationally, for countries with a mix of public, private and not-for-profit providers.

A study’s significance is also contingent upon potential weaknesses of its data sources. With an administrative dataset, there may be coding inaccuracies, either intentional (up-coding) or accidental. To some extent, coding inaccuracy is pre-empted by the NHI Bureau’s rigorous oversight system. As noted earlier, the full CS rate is reimbursed only if the patient is DRG-coded as 0371A implying medically necessary CS. Medical necessity is regularly audited by using a random sample of records from each hospital, looking for secondary diagnoses that justify a CS. Therefore, the provider has every incentive to ensure documentation of secondary diagnoses that clinically justify CS. Beyond the rigor of audits, the NHI’s ceiling of 30% for clinically indicated CS for all institutions serves as an additional deterrent. Exceeding this rate attracts a detailed audit, followed by high fines (100 times the reimbursement rate) and censures, for clinically unjustified CS that are coded as ‘‘clinically indicated CS.’’

All categories of institutions show about an overall CS rate of 30%, after allowing for differences in prevalence of complications and older mothers. (The overall CS rate among public, FP and NFP hospitals is 35.3, 32.4 and 33.1%, respectively and request CS rates are 1.07, 1.2 and 2.09%. The respective percentages of mothers with previous CS and indisputable indications (breech, dystocia or fetal distress) are 30.6, 29.3 and 24% and mothers aged over 35, 23.36, 19.19 and 13.5%. Among clinics the overall CS rate is 32.9%, request CS rate is 2.06%, comparable complication incidence is 26.4% and mothers aged over 35, 13.1%.)

Apart from audit procedures, the BNHI also supports a patient grievance mechanism. Patients also exercise consumer power; they have full choice of providers without restrictions and there is high provider competition. Providers have to be responsive to patients’ concerns in order to attract and retain clientele. In case of request CS, patients have to pay the cost difference between vaginal delivery and CS, out-of-pocket. Therefore, providers are unlikely to classify a clinically necessary CS as ‘‘request CS’’. Between the BNHI’s reimbursement, CS rate norm, patient satisfaction imperatives and patient billing issues, providers have every incentive not to classify a medically necessary CS as request CS. Therefore, we believe that most of the request CS cases in our sample are truly request CS.

Another possibility is provider-driven up-coding of uncomplicated deliveries as ‘‘clinically complicated’’, to gain eligibility for full CS rate reimbursement and spare the patient the out-of-pocket 50% charge. Therefore, an indeterminate number of request CS cases are possibly among the excluded ‘‘clinically indicated CS (0371A)’’

group. However, the NHI's ceiling of 30% serves to check the magnitude of up-coding. Given the financial incentives of a clinically indicated CS (full reimbursement from BNHI rather than having to bill the patient), it is likely that FP providers may disproportionately up-code a request CS to clinically indicated CS, rather than vice versa. Our study sample excludes up-coded cases and yet, shows significantly higher request CS likelihood among FP providers and lower level institutions. This strongly suggests a significant impact of FP ownership and hospital level on request CS likelihood.

A second potential confounder is patients' socio-economic status (SES), which may influence cesarean preferences. Higher SES women may prefer CS and may choose FP hospitals, perceiving them as ''customer-friendly,'' and more accommodative toward patient preferences. Self-selection of these women to FP hospitals is unlikely to be the reason for our findings. FP RHs have lower request CS odds than FP DHs. It is generally unlikely that women preferring CS delivery are selecting FP DHs over FP RHs, which are better endowed with hi-tech infrastructure. However, it is possible that teaching hospitals have other features (medical students, too many persons attending the delivery, etc.) that discourage these women from choosing them. Due to these potentially contradictory forces, we are unable to rule out self-selection of women desiring cesarean delivery to district hospitals.

Overall, we concur with past authors, who suggested that FP ownership is associated with higher elective CS rates based on convenience samples, provider surveys and ecologic analyses from the US, South Africa, Taiwan, Spain and Latin American countries [1,2,22–24]. Our findings arise from population-based data and are consistent with our hypotheses. The findings regarding FP DHs and clinics support the expectations of the property rights theory that FP institutions are considerably driven by revenue considerations, relative to public and NFP institutions. In case of request CS, although providers are reimbursed at vaginal delivery rates for maternally requested CS, they can bill patients for the difference. The odds ratio differences among FP versus non-FP *higher level* hospitals and FP versus non-FP institutions among *lower level* institutions differentiate the effect of teaching status from that of ownership. However, potential confounding between hospital size and teaching status is possible, because of the lack of large non-teaching hospitals in Taiwan.

Differences between NFP and public medical centers could be considered anomalous, given that both are not for profit. A combination of factors may be driving this phenomenon. NFPs typically have different compensation mechanisms and patient satisfaction imperatives relative to public hospitals. All public hospital physicians are salaried employees without exception. Public hospital employees do not gain anything from the revenues that they generate for the hospital from NHI reimbursement. Thus, procedure preference based on revenues, or striving to satisfy patients to retain clientele is not a universal priority of public hospital physicians. NFPs, on the other hand, use different combinations of salary and performance-based incentives to encourage performance and to retain high profile physicians. NFPs are also generally perceived as more responsive to patient requests, either due to their mission orientation, or due to having a private (in contrast to public) institutional culture. It is possible that patients who prefer cesarean delivery may select NFPs in view of their reputation for being accommodative.

A question arises, why clinics, which have the lowest level of infrastructure in Taiwan, are not showing the highest request CS propensity. Our findings from the current study's sub-set of deliveries should be read in combination with findings for the physician-decided CS group. Lin and Xirasagar demonstrated that ob/gyn clinics were far more likely than any other category of institution to have physician-directed cesarean delivery, adjusted for co-morbidity, age and other factors [1]. Using 2000 NHI data on physician-directed CS, they also observed that clinic physicians manifested very low thresholds for CS, in all categories of secondary obstetric/medical diagnoses including the most trivial, judged by internationally accepted, state-of-art obstetric practice. The current study showing FP DHs rather than clinics having the highest *request CS propensity* (using 4-year data) may be reflecting clinics' CS rate saturation (up to the 30% ceiling) by choosing physician-elected CS when there was *any* secondary diagnoses. Thus, for *maternal request CS*, the next higher level of FP institution, DHs should show the highest CS propensity, which is consistent with our finding. A complementary reason for FP DHs showing higher request CS rates than clinics could be that mothers preferring operative delivery may prefer a hospital setting over a clinic, given the superior infrastructure at hospitals.

Another argument could be made that differences in attending personnel (midwives or nurses versus physicians) at the different levels of hospitals may be driving ''request'' CS differences. In Taiwan, by law, every delivery must be attended by a physician. What could vary by institution level, is the number and type of additional personnel who could educate or dissuade mothers desiring CS. Larger, teaching hospitals would have residents and senior nurses available, to spend time talking to the patient, apart from the attending obstetrician. Within teaching hospitals, we find FPs having higher request CS odds than NFPs and public hospitals, while having far lower odds than FP non-teaching institutions. Therefore, we conclude that our findings are collectively consistent with FPs' profit motivation, moderated by the teaching mission and hi-tech case focus of teaching institutions. It must be cautioned, however, that since all large hospitals (250-plus beds) are teaching institutions, there is the potential for ''teaching status'' effect to be confounded by other factors that may accompany increasing hospital size. Due to lack of non-teaching large hospitals in Taiwan, we are unable to test this issue.

Overall, request CS comprised 5.2% of all CS in Taiwan during 1997–2000 (18,485 request CS out of total 356,593 CS; see Table 1). This is comparable to Norway (7.6% in 2002) [11] and Italy (9% in 2000) [10] and is consistent with

the range of 4–18% reported by Turner based on an international literature review of request CS [25].

4.1. Future research and policy implications

Our findings have significant implications for policy-makers, internationally. Systematic variations in request CS indicate a policy space for reducing these rates. In Taiwan, as in many other countries, one cesarean delivery almost guarantees future cesareans for these mothers. The secondary CS rate in Taiwan is 98.1%, compared to 93% in the US and 68% in Hungary [1,25,26]. Although the evidence is building up against clinically unnecessary CS [16], policy-makers continue to receive conflicting signals from practising obstetricians about its value and health impact. Faced with the challenge of maximizing the public's health, policymakers should sponsor longitudinal follow-up studies to disentangle myth from reality regarding the benefits of CS versus vaginal delivery [1,27]. Such studies are expensive, but not prohibitive given the population-based data that is possible from national databases such as that of Taiwan. Data on long-term morbidity and costs of additional health care utilization can be used to initiate scientifically validated policies to reduce request CS rates, by educating physicians and patients.

4.2. Study limitations

Our study does not account for the subsidies enjoyed by public and NFP hospitals, from the government and private charities. We have no data on these subsidies. If these are substantial, our findings may not represent a conscious, revenue-maximizing behavior of FPs, but instead would reflect less aggressive pursuit of fiscal goals by public and NFP institutions.

Lastly, our findings indicate the *average* profile of FP versus non-FP clinical practice patterns and in no way impute financial motive as the key driver of *all* FP providers' behaviors. Undoubtedly, a substantial proportion of providers practice medicine with their patients' best interests in mind and possibly, all providers are substantially driven by this motivation. We present our findings and interpretations from the perspective of formulating research and policy agendas that will further enhance the cause of the public's health.

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Appendix A

See Table A.1.

Table A.1
Distribution of incidental co-morbidities among maternal request CS cases with any medical/obstetric secondary diagnosis (total 4365 cases out of 18,386 request CS cases)

Diagnosis	ICD-9-CM	No.	Percent of total
Premature rupture of membranes	658.1	754	17.3
Unspecified indication for care or intervention related to labor and delivery	659.9	694	15.9
Other specified indications for care or intervention related to labor and delivery	659.8	524	12.0
Spina bifida	741	362	8.3
Other complications of labor and delivery	669.8	346	7.9
Early onset of labor	644.2	262	6.0
Mild or unspecified pre-eclampsia	642.4	140	3.2
Excessive fetal growth	656.6	128	2.9
Elderly primigravida	659.5	122	2.8
Late pregnancy	645	114	2.6
Delayed delivery after spontaneous or unspecified rupture of membranes	658.2	98	2.2
Oligohydramnios	6580	96	2.2
Hemorrhage from placenta previa	641.1	94	2.1
Anemia	648.2	78	1.8
Abnormal glucose tolerance	648.8	62	1.5
Induced labor-failed or outcome unspecified	659.1	60	1.4
Cervical incompetence	654.5	60	1.4
Transient hypertension of pregnancy	642.3	56	1.3
Placenta previa without hemorrhage	641.0	52	1.2
Severe pre-eclampsia	642.5	46	1.1
Unspecified complication of labor and delivery	669.9	36	0.8
Others[a]		178	4.0

[a] Other diagnoses with less than 30 cases.

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