

BMJ Open Which patients receive surgery in for-profit and non-profit hospitals in a universal health system? An explorative register-based study in Norway

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ABSTRACT

Objectives To compare the socioeconomic status (SES) and case-mix among day surgical patients treated at private for-profit hospitals (PFPs) and non-profit hospitals (NPs) in Norway, and to explore whether the use of PFPs in a universal health system has compromised the principle of equal access regardless of SES.

Design A retrospective, exploratory study comparing hospital types using the Norwegian Patient Register linked with socioeconomic data from Statistics Norway by using Norwegian citizens' personal identification numbers.

Setting The Norwegian healthcare system.

Population All publicly financed patients in five Norwegian metropolitan areas having day surgery for meniscus (34 100 patients), carpal tunnel syndrome (15 010), benign breast hypertrophy (6297) or hallux valgus (21 35) from 2009 to 2014.

Primary outcome measure Having surgery at a PFP or NP.

Results Across four unique procedures, the adjusted odds ratios (aORs) for using PFPs were generally lower for the lowest educational level (0.77–0.87) and the lowest income level (0.68–0.89), though aORs were not always significant. Likewise, comorbidity and previous hospitalisation had lower aORs (0.62–0.95; 0.44–0.97, respectively) for having surgery at PFPs across procedures, though again aORs were not always significant. No clear patterns emerged with respect to age, gender or higher levels of income and education.

Conclusions The evidence from our study of four procedures suggests that equal access to PFPs compared with NPs for those patients at the lowest education and income levels may be compromised, though further investigations are needed to generalise these findings across more procedures and probe causal mechanisms and appropriate policy remedies. The finding that comorbidity and previous hospitalisation had lower odds of treatment at PFPs indicates that NPs play an essential role for more complex patients, but raises questions about patient preference and cream skimming.

INTRODUCTION

Background

The tax-based Norwegian universal health system is built on the principle of equal access

Strengths and limitations of this study

- The study of the free choice of hospital system enables comparisons between private for-profit hospitals (PFP) and non-profit hospitals (NPs) in a universal healthcare system.
- The use of Norwegian citizens' personal identification numbers enables linkage of data from two large and comprehensive nationwide registers allowing the population of publicly financed patients in metropolitan areas to be most accurately represented.
- The explorative focus adds to the limited literature on socioeconomic and case-mix differences between PFPs and NPs in universal health systems, but further research is needed to explain the observed patterns.

to health services regardless of socioeconomic status (SES), ethnicity and geographical residence.¹ Norway is recognised as an overall top performer among Organisation for Economic Co-operation and Development countries on various health measures and provides a comprehensive coverage of health services for the entire population.¹ However, substantial challenges related to cost increases and long waiting times for elective surgery prompted Norway's hospital reform and the implementation of a 'free hospital choice system' (FHCS) early in the millennium.² In recent decades, countries with tax-based publicly financed and provided universal healthcare systems have experienced increased attention from private providers. However, limited knowledge exists about the effects of expanding the use of private hospitals in universal health systems.^{3 4}

¹The Ministry of Health and Care Services; The Norwegian Patients' Rights Act § 1–1.

Table 1 Overview of the Norwegian health system

Organisation	Free hospital choice system
The Norwegian healthcare system is founded on the principles of universal access. The system is mainly financed by taxation and health services are largely provided through public entities.	GPs act as gatekeepers responsible for referring patients to specialised health services. Patients having a referral from a GP have the right to freely choose hospitals included in the FHCS, both public and private, owned by or in contract with the RHAs, for the same copay. Maximum total annual copay in 2017 was NOK 2205 (~£200).
The system is organised in two administrative layers: the municipalities and the central state. The municipalities (428) are responsible for financing and providing primary care, and the central state (through four RHAs) is responsible for financing and providing specialised health services.	GPs are obliged to provide the patient information and recommendations specific to the patient's individual situation. Patients and GPs can access information and guidance about the FHCS (eg, applicable patient rights, hospitals included in the FHCS for specific treatments as well as some waiting time information and quality indicators) by telephone or internet.
The RHAs own all public hospitals and contracts with PNPs and PFPs. When a PFP wins a contract (usually by competitive tendering), it is included in the Free Hospital Choice System.	The patient has the right to have the referral evaluated by the receiving hospital within ten business days, reduced from 30 days in 2015.
The largest private hospitals are non-profit hospitals with defined catchment areas, mainly funded by the public in a combination of risk-adjusted capitation and activity measured by Diagnosis-Related Groups, similar to public hospitals. The first Norwegian PFP was established in 1985, but had only modest activity until just after the millennium.	Following the evaluation, the patient is given a time limit for examination and potential treatment. If the time limit is exceeded, the responsible RHA must cover the cost of examination and/or treatment at another hospital domestically or abroad.

FHCS, free hospital choice system; GP, general practitioner; PFP, private for-profit; PNP, private non-profit; RHA, Regional Health Authority.

The Norwegian hospital reform of 2002 formed the basis for outsourcing health services to private for-profit hospitals (PFPs).⁵ The Patients' Rights Act, implemented in 2001, prepared the ground for the implementation of the FHCS. The inclusion of PFPs in the FHCS created a new funding source for PFPs. Inclusion resulted in a substantial increase

in the share of total elective day surgeries in Norway performed at PFPs: from 2.2% in 2001 to 10.4% in 2014.⁶

In the FHCS, patients with a referral from a general practitioner (GP) for specialised health services have the right to freely choose hospitals, both public and private, owned by or in contract with the Regional Health Authorities (RHAs), for the same copay.⁵ The most salient facts about the Norwegian health system are summarised in [table 1](#).

An overview of the payer-provider relationship and the patient choice process is provided in [figure 1](#). PFPs perform day surgeries at markedly lower prices compared with the national prices used in public hospitals (PUBs). It is believed that these lower prices are, in part, a result of competitive tendering. Potential explanations for the price difference may be: the lack of acute services at PFPs; a less severe patient population; reduced teaching responsibilities, which affects the costs both directly (ie, through lower teaching costs) and indirectly (ie, more experienced surgeons make fewer surgical errors and perform more effective surgery); the ability to streamline production and exploit scaling effects and the ability to hire doctors as independent contractors, reducing downtime and avoiding payroll tax.⁶

Patient waiting time has long been used as an important indicator of access to care.⁷ In general, waiting times decreased in the early years following the hospital reform,ⁱⁱ but the overall effect of patient choice on waiting times has

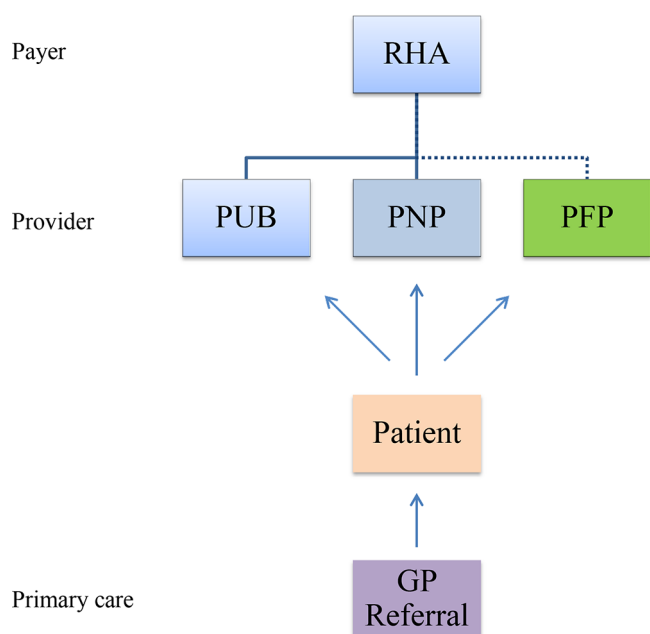


Figure 1 Organisation and the patient choice process. GP, general practitioner; PFP, private for-profit; PNP, private non-profit; PUB, public; RHA, Regional Health Authority. Illustrated by the authors.

ⁱⁱ <https://www.stortinget.no/nn/Saker-og-publikasjoner/publikasjoner/Innstillingar/Stortinget/2014-2015/inns-201415-224/1/#a1.6>.

yet to be demonstrated.⁸ Limited knowledge exists about the effects the increased use of PFPs as a policy option may have on Norway's principle of equal access to health services. However, a report from the Office of the Auditor General of Norway found that 80% of the patients who chose a PFP faced shorter waiting times compared with the average waiting time for the same procedure at their local hospital.ⁱⁱⁱ

International empirical studies comparing private and public hospitals in universal health systems are relatively limited, differ in their conclusions and are primarily from countries with different healthcare systems than the Nordic system. In Norway, Grotle *et al* found patients operated on for lumbar discus herniation at private hospitals to be slightly younger and more often male, with a higher level of education and higher likelihood of employment compared with PUBs. However, the indications for surgery appeared similar in both hospital types.⁹ In Denmark, patients having cataract surgery in private versus public hospitals were found to be healthier and younger at the time of their first surgery.¹⁰ Another Danish study found a significantly higher share of patients aged 35 years and older having arthroscopic meniscal procedures in private compared with public hospitals.¹¹ In studies examining private and public hospitals in the comparable English National Health Service, younger patients, a more favourable case-mix (ie, less severe preoperative symptoms and lower levels of comorbidity and American Society of Anesthesiologists classification) and higher SES (ie, more affluent and less likely to come from deprived areas) were generally more common in patients receiving care in PFPs.^{12–15} With regard to different healthcare systems, a recent study in the USA found that PFPs and NPs differ in terms of patient characteristics (including level of education and income) and how care is provided.¹⁶ Despite certain differences, these prior studies suggest that patients undergoing the same surgical procedures at PFPs and NPs may differ in factors relevant to Norway's principle of equal access regardless of SES.

The aim of the present study was to explore and compare the patient groups who underwent surgical treatments at PFPs with those treated at PNPs and PUBs from 2009 to 2014. We were particularly interested in exploring indications of whether the use of PFPs following the reform—aimed at containing costs and reducing wait times for elective surgery—had compromised the principle of equal access regardless of SES. Due to the many similarities between PNPs and PUBs in terms of organisation, operation (scope of services, departments and teaching responsibilities) and financing scheme, we found it reasonable to analyse these non-profit hospitals

(NPs) together. We analysed where patients received treatment and not whether patients received care overall; hence, efforts to detect explanatory factors for analysed treatment patterns were outside the scope of the exploratory focus of the present study.

We speculated that patients with higher SES may be better at navigating the system and would choose the for-profit alternative when this was viewed as advantageous, for example with regard to shorter wait time.^{iv} Another potential benefit of using PFPs is that patients are almost always treated by an experienced surgeon. Most Norwegian PFPs exclusively hire fully trained specialists and provide very limited medical training.⁶ We also speculated that, even for the same procedures, PFPs would have a younger, healthier case-mix compared with NPs, due to three main factors: patient preferences, PFP hospitals' contracts and organisation and cream skinning. As none of the Norwegian PFPs have a fully equipped emergency department, they do not contractually^v treat the most complex patients because the risk of serious complications is considered too high. PFPs may also have a financial incentive to accept younger and less complex patients, since it is generally less expensive to treat less complex patients.

METHODS AND STATISTICS

Data sources

The study cohort was identified through The Norwegian Patient Register (NPR), which contains data on all patients having received treatment at any Norwegian hospital or by a specialist physician. Using Norwegian citizens' mandatory personal identification numbers (PIN), we were able to link individuals to education and income data from Statistics Norway.^{vi} Information regarding all hospitals announced on the internet as being included in the FHCS was released by the Norwegian Directorate of Health. Strict regulations for handling sensitive data guided our work and each PIN was replaced by a unique, anonymous serial number before research began.

Study population and geographical concentration areas

We used two criteria to select the study population. First, the procedures had to be included in the FHCS and carried out at both PFPs and NPs between 2009 and 2014. Second, to increase the study's power to detect differences, the procedures had to be performed relatively frequently at both hospitals. Since patients, GPs and surgeons often do not know the exact procedure to be performed at the time of referral and choice of hospital, we selected our patients based on combinations of

ⁱⁱⁱRiksrevisjonens undersøkelse av ordningen med rett til fritt sykehusvalg, Overlevert Stortinget 20.10.2011.

^{iv}Riksrevisjonens undersøkelse av ordningen med rett til fritt sykehusvalg, Overlevert Stortinget 20.10.2011.

^vWith their respective RHA.

^{vi}Income data was registered from tax returns of all Norwegian residents; The highest level of education achieved by all residents, age 16 and older.

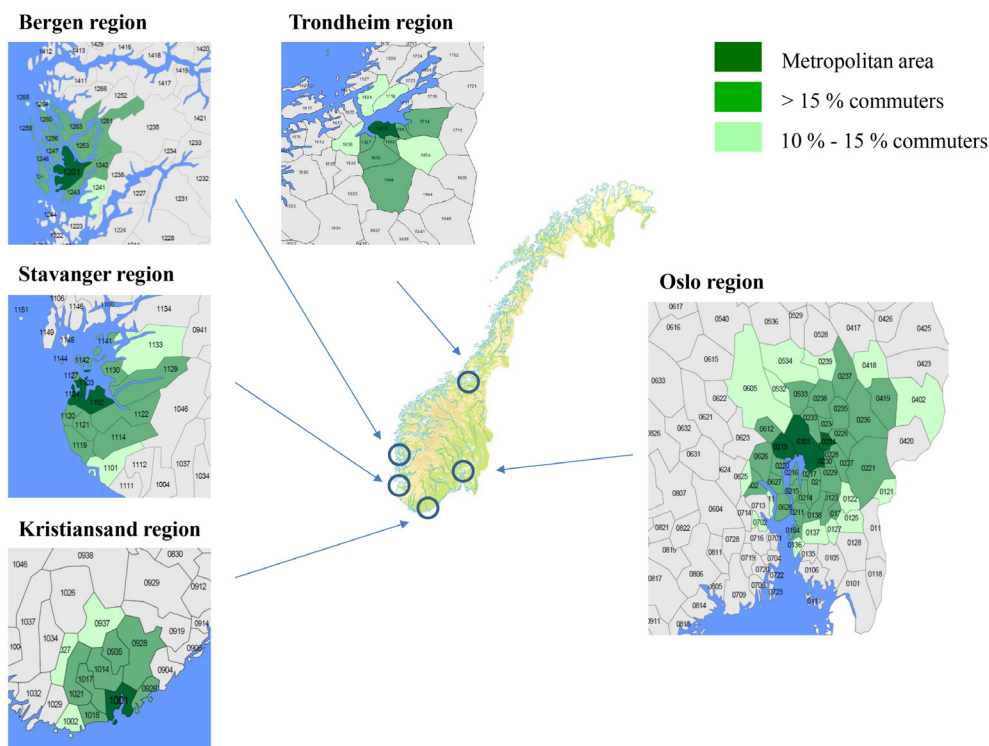


Figure 2 Metropolitan areas. Illustration by Juvkam *et al*¹⁷: Dark green represents the centre of the metropolitan area; Green represents the areas where more than 15% of the population regularly commute into the centre area; Light green represents areas where between 10% and 15% of the population regularly commute into the centre area.

Diagnosis-Related Group (DRG) and International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Based on these criteria, we included all patients with the following DRG and ICD-10 combinations (table 2).

We were interested in comparing publicly financed patients under the FHCS, so patients financed out-of-pocket or by voluntary private health insurance were excluded. Since patients often did not have an option to choose a hospital if the individual set time limit was exceeded and the patients demanded treatment within the time limit, all patients financed under the time limit violation arrangement were also excluded.

We focused on Norway's five metropolitan areas (MAs), where almost all PFPs are located. These regions circle around the cities of Oslo, Trondheim, Bergen, Stavanger and Kristiansand and together host half of Norway's approximately 5.25 million residents.^{vii} By focusing on MAs, we reduced the bias distance-to-hospital may impose when comparing PFPs and NPs, since distances within these areas are small and comparable between hospitals. The MAs were further divided into subareas using functional boundaries developed by Juvkam *et al*,¹⁷ and we included populations residing in the centre and in areas

where more than 15% of residents regularly commute into the centre (figure 2).

Variable definitions

We treated having surgery at a PFP or NP as our primary outcome measure. Independent variables included income,^{viii} education, age, gender, comorbidity using the Charlson Comorbidity Index (CCI) and hospitalisation the previous year (HPY) (indicating whether the patient had been hospitalised at any hospital within 365 days

Table 2 Study cohort

DRG		ICD-10	
2220	Day surgery on humerus, knee, leg/foot	M232	Derangement of meniscus due to old tear or injury
60	Day surgery for carpal tunnel syndrome	G560	Carpal tunnel syndrome
2610	Day surgery on benign mammae (excl. biopsy/local excision)	N62	Hypertrophy of breast
2250	Day surgery on ankle and foot	M201	Hallux valgus (acquired)

ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision.

^{vii}Statistics Norway. Population 1 January 2016. The whole country, counties and municipalities. <https://www.ssb.no/en/befolkning/statistikker/folkemengde/aar-per-1-januar/2016-02-19?fane=tabell&sort=nummer&tabell=256009> (retrieved 20 September 2017).

^{viii}Calculated as an arithmetic average of the individual's income in 2000–2008, not adjusted for inflation.

prior to the date of the surgical procedure). The CCI was calculated from main diagnosis or secondary diagnoses¹⁸ recorded 365 days prior to the date of the procedure and was made binary since the initial analyses revealed a relatively healthy patient group.

Analytical approach and statistical methods

Mean, SD and frequencies were first used to present an unadjusted description of the patient sample for the four DRG and ICD-10 combinations. We used logistic regression analysis^{ix} to assess the case-mix as two discrete outcomes—treatment at PFPs versus treatment at NPs—and adjusted for case-mix differences using the described patient-level and socioeconomic covariates. Any missing register data for an individual were handled using the listwise deletion technique. All variables, including the five MAs and year, were treated as fixed effects. The adjusted OR and a 95% CI were calculated, and we reported per cent concordant (%C) and Akaike information criterion as goodness-of-fit measures. We performed the analyses using the statistical software SAS V.9.4.^x

Patient and public involvement

The present register-based study was approved by the Norwegian Regional Committees for Medical and Health Research Ethics and the Norwegian Data Protection Authority, who consented to the conduct of the study on behalf of all Norwegian patients.

RESULTS

Patients and hospital characteristics

In total, 57 542 patients were included. Of these, 24 812 patients had surgery at PFPs and 32 730 at NPs. Descriptive statistics about the patient sample included in the study are reported in [table 3](#).

Excepting the benign breast hypertrophy procedure, NPs treated more patients than PFPs did. In unadjusted analyses, PFPs had a lower share of patients with the lowest level of education compared with NPs across procedures. Although patients with upper secondary education were most represented in both PFPs and NPs for two of the procedures, PFPs treated a larger share of patients with an undergraduate level of education than NPs across all procedures. Conversely, except for the carpal tunnel syndrome patient group, PFPs treated a lower share of patients with the highest level of education compared with NPs. PFPs also treated a lower share of patients with income below NOK 200 000 compared with NPs, again excepting the carpal tunnel syndrome patient group. Patients with income between NOK 200 and 399 999 were represented with a larger share in two procedures at both

PFPs and NPs, but PFPs treated a larger share of patients with income between NOK 400 and 599 999 compared with NPs across all procedures. For patients with income between NOK 600 and 799 999, PFPs and NPs again treated a larger share of patients in two procedures each, while among the highest income group (\geq NOK 800 000), PFPs treated a larger share of patients than NPs across procedures, excepting the benign breast hypertrophy patient group.

The share of patients with a CCI score and the share of patients hospitalised the year prior to the procedure were lower at PFPs compared with NPs, across all procedures. Though the share of male patients was lower at PFPs compared with NPs across all procedures, the mean age was highest in two of the procedures at both PFPs and NPs. The descriptive statistics of the five regions are included in the online supplementary tables A1–A4.

Regression analyses

The odds of having surgery at PFPs were consistently lower across procedures among the lowest educated patients (primary and lower secondary, upper secondary); compared with the reference group (undergraduate), these results were only significant among the primary and lower secondary level patients having meniscus and carpal tunnel surgery and among upper secondary level patients having benign breast hypertrophy surgery. However, the odds of having surgery among patients with the highest level of education (graduate) compared with the reference group had no clear pattern across procedures, but the odds of having surgery at PFPs compared with NPs were significantly lower among the patients with meniscus injury ([table 4](#)).

The odds of having surgery at PFPs compared with NPs among patients in the lowest income category (\leq NOK 199 999) were lower for PFPs compared with NPs across procedures and significantly lower among the patient groups with meniscus and benign breast hypertrophy. When examining the next income level (NOK 200–399 999), we did not find a clear pattern and none of the results were significant. We found neither clear patterns nor significant results among the highest income categories (NOK 600–799 999 and \geq NOK 800 000). In the second highest income category, the odds were higher for two procedures at both PFPs and NPs, while the odds of having surgery at PFPs compared with NPs for the highest income category were now higher among three of the procedures (excepting patients with carpal tunnel syndrome).

The odds of having surgery at PFPs among patients with a positive CCI score were consistently lower across procedures and significantly lower among the patients with carpal tunnel syndrome and benign breast hypertrophy. The respective odds for previously hospitalised patients were also consistently lower across procedures and significantly lower for all procedures excepting the patients with hallux valgus.

^{ix}Applying SAS PROC LOGISTIC.

^xSAS, Cary, North Carolina, USA.

Table 3 Descriptive statistics for publicly funded FHCS patients 2009–2014

	Meniscus			Carpal tunnel syndrome			Benign breast hypertrophy			Hallux valgus						
	DRG 2220 and ICD M232			DRG 60 and ICD G560			DRG 2610 and ICD N62			DRG 2250 and ICD M201						
	PFP (N)	NP (N)	Mean (SD)	PFP (N)	NP (N)	Mean (SD)	PFP (N)	NP (N)	Mean (SD)	PFP (N)	NP (N)	Mean (SD)				
	15855	18245	2589	12421	5759	538	609	1526								
Mean (SD)	13.12	48.89	13.38	15.22	55.82	15.36	41.78	13.79	39.56	15.85	51.19	13.66	51.91	14.22		
N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
Age (mean years)	9609	60.61	11206	61.42	842	32.52	4104	33.04	296	5.14	212	39.41	54	8.87	145	9.50
Male	742	4.68	914	5.01	255	9.85	1540	12.40	255	3.91	46	8.55	29	4.76	94	6.16
CCI>0	1069	6.74	1818	9.96	302	11.66	1937	15.59	557	9.67	83	15.43	49	8.05	147	9.63
HPY	2950	18.61	4267	23.39	390	15.06	1825	14.69	2507	43.53	280	52.04	116	19.05	302	19.79
Age group 18–49 years*	4161	26.24	4924	26.99	536	20.70	2463	19.83	1506	26.15	100	18.59	155	25.45	341	22.35
Age group 50–59 years	4435	27.97	4878	26.74	638	24.64	3166	25.49	1081	18.77	86	15.99	153	25.12	381	24.97
Age group 60–69 years	3287	20.73	3255	17.84	509	19.66	2385	19.20	578	10.04	53	9.85	134	22.00	350	22.94
Age group 70–79 years	1022	6.45	921	5.05	516	19.93	2582	20.79	87	1.51	19	3.53	51	8.37	152	9.96
Age group ≥80 years	2867	18.26	3716	20.72	672	26.40	3493	28.61	1407	24.66	141	26.36	104	17.19	313	20.77
Primary and lower secondary school†	7680	48.90	8525	47.54	1209	47.50	6067	49.69	2488	43.61	273	51.03	262	43.31	627	41.61
Upper secondary school	3842	24.46	4107	22.90	525	20.63	2137	17.50	1570	27.52	96	17.94	190	31.40	434	28.80
Undergraduate	1316	8.38	1584	8.83	139	5.46	513	4.20	240	4.21	25	4.67	49	8.10	133	8.83
Graduate	1159	7.31	1591	8.72	155	5.99	700	5.64	851	14.78	131	24.35	53	8.70	166	10.88
Income≤NOK 199 999‡	3565	22.49	4183	22.93	964	37.23	5132	41.32	2037	35.37	173	32.16	200	32.84	485	31.78
Income NOK 200–399 999	8521	53.74	9647	52.87	1258	48.59	5708	45.95	2598	45.11	206	38.29	310	50.90	750	49.15
Income NOK 400–599 999	1785	11.26	1898	10.40	154	5.95	622	5.01	213	3.70	21	3.90	32	5.25	97	6.36
Income NOK 600–799 999	825	5.20	926	5.08	58	2.24	259	2.09	60	1.04	7	1.30	14	2.30	28	1.83
Income≥NOK 800 000																

*Age was divided into five groups: age group 0 included patients aged 18–49 years, age group 1 included patients aged 50–59 years and then 10-year interval groups up to age group 5, which covered all patients aged 80 years and above.
 †Education was divided into four groups: individuals who completed lower secondary school; individuals who completed upper secondary school prior to 1974/1975, regardless of schooling duration; individuals who completed a tertiary degree up to 4 years in duration, prior to 1998/1999 and individuals who completed a postgraduate tertiary degree (the majority of which were 5 years or longer in duration).
 ‡Income was divided into five groups: income≤NOK 199 999, income NOK 200–399 999, income NOK 400–599 999, income NOK 600–799 999 and income≥NOK 800 000.
 CCI, Charlson Comorbidity Index; FHCS, free hospital choice system; HPY, hospitalisation the previous year; ICD, International Statistical Classification of Diseases and Related Health Problems; NP, non-profit; PFP, private for-profit.

Table 4 Probability of hospital treatment PFPs (1) versus NPs (0) (adjusted ORs (CI))

	Meniscus DRG 220 and ICD M232		Carpal tunnel syndrome DRG 60 and ICD G560		Benign breast hypertrophy DRG 2610 and ICD N62		Hallux valgus DRG 2250 and ICD M201	
	Adjusted OR	CI	Adjusted OR	CI	Adjusted OR	CI	Adjusted OR	CI
Male	1.002	0.954 to 1.053	1.027	0.911 to 1.159	0.118*	0.089 to 0.157	1.020	0.694 to 1.500
CCI>0	0.947	0.849 to 1.055	0.838*	0.711 to 0.987	0.619*	0.388 to 0.989	0.701	0.426 to 1.153
HPY	0.667*	0.613 to 0.726	0.760*	0.651 to 0.888	0.442*	0.320 to 0.610	0.970	0.655 to 1.436
Age group 18–49 years†	0.802*	0.748 to 0.861	1.292*	1.082 to 1.542	1.252	0.889 to 1.764	1.023	0.719 to 1.456
Age group 50–59 years	0.916*	0.862 to 0.974	1.152	0.977 to 1.359	1.024	0.719 to 1.459	1.271	0.935 to 1.728
Age group 60–69 years	ref	ref	ref	ref	ref	ref	ref	ref
Age group 70–79 years	1.132*	1.059 to 1.210	1.124	0.957 to 1.320	0.969	0.627 to 1.500	0.891	0.650 to 1.222
Age group ≥80 years	1.282*	1.155 to 1.424	1.090	0.927 to 1.281	0.315*	0.156 to 0.636	0.748	0.483 to 1.157
Primary and lower secondary school‡	0.869*	0.809 to 0.933	0.842*	0.715 to 0.991	0.785	0.557 to 1.106	0.774	0.556 to 1.077
Upper secondary school	0.975	0.920 to 1.032	0.926	0.801 to 1.070	0.690*	0.512 to 0.930	0.975	0.749 to 1.268
Undergraduate	ref	ref	ref	ref	ref	ref	ref	ref
Graduate	0.847*	0.774 to 0.928	1.014	0.774 to 1.327	0.629	0.347 to 1.139	1.016	0.665 to 1.555
Income ≤NOK 199 999§	0.886*	0.807 to 0.973	0.895	0.673 to 1.190	0.683*	0.479 to 0.974	0.738	0.482 to 1.129
Income NOK 200–399 999	0.985	0.927 to 1.046	1.003	0.887 to 1.135	0.930	0.710 to 1.218	1.181	0.908 to 1.535
Income NOK 400–599 999	ref	ref	ref	ref	ref	ref	ref	ref
Income NOK 600–799 999	1.102*	1.021 to 1.190	1.020	0.804 to 1.295	0.733	0.401 to 1.341	0.735	0.455 to 1.188
Income ≥NOK 800 000	1.019	0.916 to 1.134	0.855	0.580 to 1.261	1.480	0.537 to 4.080	1.008	0.465 to 2.185
Fixed effects	MA¶/Year	MA¶/Year	MA¶/Year	MA¶/Year	MA¶/Year	MA¶/Year	MA¶/Year	MA¶/Year
Per cent concordant	67.9	71.3	71.3	88.3	88.3	78.0	78.0	78.0
AIC	43 277.478	8918.933	8918.933	2336.609	2336.609	2083.879	2083.879	2083.879

Correlations (Pearson Correlation Coefficient analysis) between independent variables were tested for each of the four procedures. The range of correlation were from –0.18 to 0.441, indicating that multicollinearity is not a significant problem.

*Significant result.

†Age was divided into five groups: age group 0 included patients aged 18–49 years, age group 1 included patients aged 50–59 years and then 10-year interval groups up to age group 5, which covered all patients aged 80 years and above.

‡Education was divided into four groups: individuals who completed lower secondary school; individuals who completed upper secondary school prior to 1974/1975, regardless of schooling duration; individuals who completed a tertiary degree up to 4 years in duration, prior to 1998/1999 and individuals who completed a postgraduate tertiary degree (the majority of which were 5 years or longer in duration).

§Income was divided into five groups: income ≤NOK 199 999, income NOK 200–399 999, income NOK 400–599 999, income NOK 600–799 999 and income ≥NOK 800 000.

¶Metropolitan area.

AIC, Akaike information criterion; CCI, Charlson Comorbidity Index; HPY, hospitalisation the previous year; ICD, International Statistical Classification of Diseases and Related Health Problems; NP, non-profit; PFP, private for-profit.

No consistent pattern was found with respect to gender differences. The odds among men were higher for three of the procedures. However, regarding the exception—patients with benign breast hypertrophy—men had significantly lower odds of having surgery at PFPs. With respect to age, we had several interesting findings; among the youngest age categories (18–49 and 50–59 years), the odds of having surgery at PFPs were higher for three of the procedures compared with the reference group (60–69 years). However, the exception—patients with meniscus injury—had significantly lower odds for both age categories. We did not find any consistent patterns among the highest age categories (70–79 years and ≥80 years); the odds were higher for two procedures at both PFPs and NPs. We found significantly higher odds among the patients with meniscus injury for both the highest age categories, but significantly lower odds among the patients with benign breast hypertrophy for patients in the highest age category.

DISCUSSION

Principal findings

Across four unique procedures, having the lowest level of education (primary and lower secondary; upper secondary school) and being in the lowest income group (≤NOK 199 999) were associated with lower odds of using PFPs, though not always significantly. Although the differences could not consistently be distinguished, the evidence from our study suggests that equal access to PFPs compared with NPs for those patients at the lowest income and education levels may be compromised. While we have no reason to believe that these patient groups received no care at all, and as all the other patient groups benefited from the increased capacity PFPs provide (eg, in terms of waiting time), this indicates that Norway's efforts to reduce waiting times and costs may result in difference in access to care. This is especially concerning since low SES patients are in general the most vulnerable patient group and least equipped to navigate in the system. Patients in the lowest income category are below the poverty line defined by the European Union.^{xi} Some of these patients may not actually be 'low-income' due to family support, assets or other sources of resources, but a national report by Statistics Norway indicates that the majority of individuals below the poverty line in 2014 received social security benefits.¹⁹ Among the highest educated patients the pattern was unclear, as was the pattern for higher levels of income. However, among patients in the highest income category, the odds of having surgery at PFPs were higher for three of the procedures, but non-significant.

^{xi}NOK 207 400 in 2014 for a single without children, EU-scale (60 per cent); Statistics Norway. Income and wealth statistics for households, <https://www.ssb.no/statistikkbanken/selectvarval/Define.asp?subjectcode=&ProductId=&MainTable=LavinntGrenser&nvl=&PLanguage=1&nyTmpVar=true&CMSSubjectArea=inntekt-og-forbruk&KortNavnWeb=ifhus&StatVariant=&checked=true> (retrieved 20 September 2017)

As expected, patients with a comorbidity included in the CCI and having been hospitalised the year prior to the procedure had consistently lower odds of having surgery at PFPs. While the results were not significant across all procedures, the association indicates that NPs play an essential role for more complex patients. This may be a result of the hospitals and/or the patients themselves efficiently allocating the more complex cases to NPs; however, this raises questions about patient preference and cream skimming and whether these differences are appropriate in terms of both payment levels and achieving the best possible outcomes.

No consistent patterns with respect to age and gender were found across procedures. Although there were significantly lower odds of men having benign breast hypertrophy surgery, indicating less offerings or expertise at PFPs for male patients, the odds among the other procedures were higher, though non-significant. The significant procedure-specific age differences that we found were not consistent in their direction, contradicting findings from previous studies of the Norwegian health system that showed slightly younger patients and patients more likely to be men at private hospitals.^{9 20} However, these studies were carried out on patients having more complex inpatient surgery, which may explain these age differences.

Strengths and limitations

The primary strength of our study is our access to the Norwegian Patient Register, which contains information on all patients who have received treatment at all public and private hospitals in Norway. The possibility to link these data to education and income data from Statistics Norway further strengthens our study. These large, unique data sets enable thorough research representing patients residing in MAs within the Norwegian health system. Many other studies on health systems are carried out on a limited group of patients with limited individual data.

While our results regarding hospital type comparisons are valid only for the four procedures analysed and within the specified MAs—thereby not generalisable to all activity in Norway—these procedures are among the most prevalent at both the PFPs and the NPs, making them particularly important to understand in this universal health system. Focusing on MAs also has several advantages: First, most of the PFPs in Norway are located in or close to these MAs; second, half of the Norwegian population resides in one of these regions; third, since distances within these areas are small and comparable between hospitals, this reduces the bias distance-to-hospital may impose when comparing PFPs and NPs. Indeed, Holom and Hagen included all patients in Norway and found significantly fewer patients at private hospitals with increased distance compared with PUBs.²⁰ Though Norway is an elongated country and some patients may have considerable distances to the nearest PFP, in the present study, distance's decisiveness should be limited.

Discussing important differences in the results

As speculated, three main factors may explain the observed differences: patient preference, PFP hospitals' contracts and organisation and cream skimming.

Patient preference: A patient's choice of healthcare provider is not a straightforward process, but rather a result of the interplay between the patient, the referring GP and provider characteristics.²¹ In a scoping review, Victoor *et al* found that few patients actively choose their healthcare provider and a substantial fraction consider choice to be unimportant, relying instead on their GP to make the choice. However, more highly educated patients, patients with higher income and younger patients were found to be more active participants in the decision-making process; furthermore, the degree to which patients were capable of processing information rationally was influenced by their ability to obtain, process and understand basic health information and to apply numbers to manage their health.²¹ Patients with higher SES may also put more pressure on their GPs for referrals for specialised services, thus receiving referrals more frequently.²²

Time spent on waiting lists, staff qualifications and experience²¹ and surgeon reputation²³ have been found to be important determinants of hospital choice. Additionally, in the Norwegian FHCS, patients with high income and high levels of education are found to be more active in choosing hospitals.^{xii} Ringard *et al* found indications that the increased opportunity for hospital choice in the Norwegian FHCS can reduce waiting times and that patients who had neither chosen their hospital personally nor bypassed the local hospital for other reasons had the longest waiting times. From the patient's perspective, when it came to waiting, the least beneficial option was to not choose and consequently end up at the local (NP) hospital.²⁴ Most patients are found to face shorter waiting times at PFPs compared with the waiting times they would face for the same procedure at their local (NP) hospital.^{xiii}

Ringard *et al* also found that even if a patient allowed somebody else to decide on his/her behalf—for example, if the referring GP used their knowledge about spare hospital capacity—the waiting time would be reduced if the patient was willing to travel to an alternative hospital.²⁴ In the present study, the differences with respect to SES may indicate that information that may have been valuable for helping patients effectively navigate the system were not always effectively attenuated to by GPs. Policies that strengthen patient literacy or train GPs to improve their referral practices may limit these disparities.

The finding that patients who had been hospitalised the year prior to the procedure had lower odds of having surgery at PFPs may also be explained by patients' loyalty to that hospital. Patients may find it more convenient

and comfortable to use a hospital they have already established a relationship with. Victoor *et al* found that patients tend to rely on previous experiences, with a positive experience positively affecting future choice.²¹ Since NPs provide by far the largest range of treatments in Norway, patients are more likely to have experience with these hospitals. In addition, due to data security, health records in Norway are not shared electronically between hospitals, creating a switching cost both for patients and health providers and providing an incentive for patients to return to hospitals with which they have prior experience.

Private for-profit hospitals' contracts and organisation: Since none of the Norwegian PFPs have a fully equipped emergency department, they do not, by contract,^{xiv} treat the most complex patients because the risk of serious complications is considered too high. Hospitals must indicate their specific limitations for patient admission in the contracts (ie, comorbidities, ASA classification) and the contracts clearly state that complications and situations requiring more extensive care than PFPs can offer should be referred to an NP. Chard *et al* discuss that the favourable case-mix among independent sector treatment centres in England (PFPs) is in line with their contracts.¹³ This may explain our finding that CCI and HPY were constantly associated with lower odds of having surgery at PFPs. Furthermore, PFPs in Norway are almost exclusively non-teaching hospitals,⁶ found in the international literature to treat an easier case-mix compared with teaching hospitals.²⁵

Cream skimming: The finding that patients who had a positive CCI or had been hospitalised the year prior to the procedure had lower odds of having surgery at PFPs may also be explained by cream skimming. Cream skimming—for example, by excluding complex (unprofitable) patients—has for a long time been discussed as a potential problem with commercialisation of health-care.²⁶ We speculate that PFPs may be unwilling to offer these relatively less complex surgeries to patients with comorbidities that require extra (unprofitable) considerations. On the other side, NPs may be more willing to offer surgery to more complex patients (ie, those requiring extra considerations) if they have prior experience with that patient.

Conclusion and policy implications

The evidence from our study of FHCS patients having meniscus, carpal tunnel syndrome, benign breast hypertrophy and hallux valgus surgery between 2009 and 2014 in Norway suggests that equal access to PFPs compared with NPs for those patients at the lowest education and income levels may be compromised. Policies that strengthen patient literacy or train GPs to improve their referral practices may help reduce the differences with respect to SES. We did not explicitly test the overall effect of the expansion of PFPs (eg, in terms of shorter waiting

^{xii}Riksrevisjonens undersøkelse av ordningen med rett til fritt sykehusvalg, Overlevert Stortinget 20.10.2011.

^{xiii}Riksrevisjonens undersøkelse av ordningen med rett til fritt sykehusvalg, Overlevert Stortinget 20.10.2011.

^{xiv}With their respective RHA.

times) because we lacked the needed data. However, it is reasonable to expect that such expansion has benefited all patients across the SES spectrum because as more patients are treated in PFPs, one can expect that this would reduce pressure on NPs included in the FHCS and also reduce waiting times for patients. The finding that comorbidity and previous hospitalisation were associated with lower odds of treatment at PFPs indicates that NPs play an essential role for more complex patients. This may be a result of hospitals and/or the patients themselves efficiently allocating the more complex cases to NPs; however, this raises questions about patient preference and cream skimming and whether these differences are appropriate in terms of both payment levels and achieving the best possible outcomes. Further investigations are needed to generalise these findings across more procedures and should go beyond the present explorative scope and include potential explanatory factors (such as waiting time) to explain the observed patterns to further support policy and decision makers in their health management efforts.

Contributors GHH, JDG-F and TPH conceptualised and designed the study. GHH, NA and TPH analysed the data. GHH drafted the manuscript. TPH, JDG-F and NA contributed to the background. All authors reviewed drafts of the article.

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