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ORIGINAL ARTICLE

A study to investigate the factors that influence the prescribing habits of non-consultant hospital doctors in Ireland

B. Ramasubbu[1] · M. Heron[2] · R. Ramasubbu[3] · P. Murphy[1]

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Abstract
Background The Health Service Executive estimates it spent just under €2 billion on medicines in 2013 following a fivefold increase in the cost of medicines over the preceding decade. With this increasing cost, it is important to understand what factors affect doctors prescribing.
Aims To investigate the influencing factors on prescribing of non-consultant hospital doctors (NCHDs) in Irish hospitals and to provide data regarding the sources of information NCHD's use for commonly prescribed drugs.
Methods All medical manpower offices of adult public hospitals in the Republic of Ireland were emailed with our survey for distribution to NCHDs. It contained demographic information and questions regarding factors which most influence their prescribing of particular drug groups. Tests of significance were carried out using Chi-square.
Results One hundred and seventy-nine surveys were returned out of a possible 8987 (0.02 %). Consultant preference was the biggest overall influencing factor on junior doctors prescribing (27 %). This was closely followed by local departmental policies (26 %). Evidence-based prescribing only influenced 14 % of the total prescribing of NCHDs with the pharmaceutical representative influence only a fraction behind (13 %). Knowledge obtained during medical school greater influenced postgraduate prescribing than undergraduate (34 vs 14 %, $p = 0.046$). Registrars were significantly more likely to prescribe using evidence-based medicine than intern and SHOs ($p = 0.03$).
Conclusions The prescription of medications in Ireland by NCHDs varies greatly depending not only on drug group, but it is also affected by the doctors' previous education and experience. This information is key in leading to sensible cost-effective prescribing.

Keywords Prescribing · Influencing factors · Pharmaceutical representative · Non-consultant hospital doctors

Introduction

Ireland's health service governing body the Health Service Executive (HSE) estimates it spent just under €2 billion on medicines in 2013, up slightly from the €1.95 billion it spent the year before. This is in the context of a fivefold increase in the cost of medicines over preceding decade (1997–2007) [1]. With this increasing cost to the health service, it is important to understand what factors affect doctors prescribing in Irish Hospitals. There is a wealth of prescribing information resources available to clinicians, such as other physicians, pharmacists, and pharmaceutical sales representatives (PR's). Evidenced-based research texts, such as formularies, textbooks, clinical research data, guidelines, electronic data sources, and medical journals, are also readily available to non-consultant hospital doctors (NCHD's) in Ireland. However, there is a dearth of literature to quantify which sources are most widely used in practice. This is an issue of real importance given current focus on evidence-based medicine and the broad variation

✉ B. Ramasubbu
ramasubb@tcd.ie

[1] Department of General Medicine, Midlands Regional Hospital, Tullamore, Ireland

[2] Department of Anaesthesia, St George's Hospital, London, UK

[3] Department of Undergraduate Medicine, University of Edinburgh, Edinburgh, UK

of pharmaceutical expenditure between European countries. Moreover, in 2010, data from the Organisation for Economic Co-operation and Development (OECD) stated that Ireland's pharmaceutical expenditure was significantly higher than that of the average EU countries over the past decade [2].

Thus, we aimed to investigate the influencing factors on prescribing of non-consultant hospital doctors in adult public hospitals in the republic of Ireland and to provide data regarding the sources of information NCHD's use for commonly prescribed drugs.

Methods

Following survey construction by the survey team, an email was sent to the medical manpower offices of all adult public hospitals in Ireland for its distribution to non-consultant hospital doctors. The survey contained four questions about respondent's demographics (job description, gender, university that conferred medical degree and level of entry to that university) and nine drug groups for which they had to select which factor most influenced their prescribing of that particular drug group. They were offered five choices: Consultant preference, local pharmacy/departmental policies, knowledge obtained during medical school, input from hospital pharmaceutical representative or independent/self-appraisal of evidence. Replies were collated and data analysed using Excel. Tests of significance were carried out using Chi-square.

Results

One hundred and seventy-nine surveys were returned out of a possible 8987 (0.02 %).

[The estimated Irish NCHD population for 2014 was 8987. NCHDs made up 53.9 % of the total 16,673 doctors who retained registration with the Irish Medical Council that year] [3].

Demographics

There was no significant difference in gender (51 % male vs 49 % female, $p = 0.82$). Seventy-three (41 %) senior house officers (SHOs), 65 (36 %) interns, and 41 (23 %) registrars completed the survey. There were significantly more undergraduates than postgraduates (82 vs 18 %, $p < 0.01$). Figure 1 highlights that the most surveys were completed by graduates from Trinity College Dublin 46/179 (26 %) followed by those from University College Dublin 42/179 (23 %).

Outcomes

Table 1 shows assembled data for all drug classes and influencing factors. Of note, consultant influence was the biggest overall influencing factor on junior doctors prescribing in Ireland (27 %). This was closely followed by local pharmacy/departmental policies (26 %). Evidence-based prescribing only influenced 14 % of the total prescribing of NCHDs with the pharmaceutical representative influence only a fraction behind (13 %).

Table 2 shows all grouped responses from undergraduates and postgraduates. The total responses for each of the five influencing factors were converted to percentages. Knowledge obtained during medical school greater influenced postgraduate prescribing than undergraduate (34 vs 14 %, $p = 0.046$).

Table 3 contains the collated responses from interns, SHOs, and registrars. Registrars were significantly more likely to prescribe using evidence-based medicine than intern and SHOs ($p = 0.03$).

Discussion

Demographics

Data obtained from the surveys are representative of a very small proportion of the Irish NCHD community [179/8987 (0.02 %)]. There is an even split of gender and a good representation of all job descriptions (36 % interns, 41 % senior house officers and 23 % registrars). In addition, all medical colleges in Ireland are well represented with significantly more undergraduates than postgraduates ($p < 0.01$) which is to be expected as graduate entry medical schools have only come into being in the past 9 years.

Outcomes

Consultant preference

Table 1 demonstrates that consultant preference was the largest overall influencing factor on junior doctors prescribing in Ireland (27 %). This effect can be most greatly seen on diuretic (55 %), anti-platelet (42 %), and statin prescribing (39 %). This would reflect a top down approach where by senior opinion and choice filters down to junior members of staff. This is of particular importance as statin therapy alone accounted for over 10 % of total drug acquisition costs (87.5 million euros) under the Community Drugs Scheme in Ireland in 2004 [4]. With that in mind and knowledge of this top down approach, it would be useful to know what factors influence consultant prescription of these medications. Is cost and generic

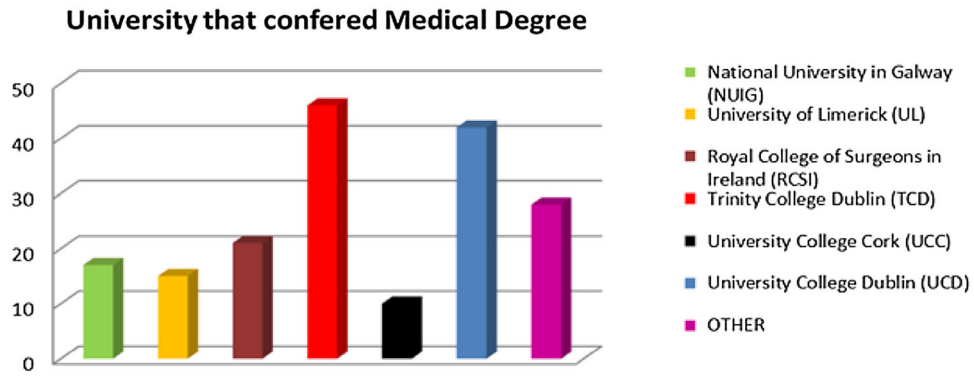

Fig. 1 The distribution of participants who responded by university which conferred their primary medical degree

Table 1 Assembled data for all drug classes and influencing factors

$n = 179$	Drug groups and the factors which influence their prescribing (%)										
	Analgesia	Antibiotic	Anti-coagulation	Anti-emetic	Anti-platelet	Diuretic	Night sedation	Proton pump-I	Statins	Total	Overall total (%)
Consultant	22	24	30	11	42	55	6	18	39	247	27
Local policy	17	59	32	28	20	11	33	20	15	235	26
Knowledge	29	8	4	35	13	17	35	16	19	176	20
Pharma rep	11	1	28	8	11	3	6	33	15	116	13
Evidence	21	8	6	18	14	14	20	13	12	126	14
Total	100	100	100	100	100	100	100	100	100	900	100

Table 2 Grouped responses from undergraduates and postgraduates for their most influential prescribing factor from all nine drug groups by percentage

$n = 179$	Undergraduate (%)	Postgraduate (%)	p value
Consultant	31	24	0.54
Local policy	28	12	0.068
Knowledge	14	34	0.046
Pharmaceutical rep	14	15	0.89
Evidence	13	15	0.77
Total	100	100	

Table 3 Collated responses from interns, SHOs, and registrars for their most influential prescribing factor from all nine drug groups by percentage

$n = 179$	Intern (%)	SHO (%)	Registrar (%)	p value
Consultant	32	29	20	0.52
Local policy	26	27	22	0.88
Knowledge	21	21	15	0.71
Pharmaceutical rep	11	13	15	0.83
Evidence	10	10	28	0.03
Total	100	100	100	

prescribing considered or what factors are most influencing them? This information is vital as it is having a knock on effect on junior staff and importantly, better prescriptions could have massive impacts on cost saving for the HSE.

Local policy

Local/departmental policy accounted for 26 % of overall junior doctor prescribing. It was most important in the prescribing of antibiotics (59 %, significantly more than any other factor $p < 0.01$). The second most influential factor in the prescribing of antibiotics was consultant preference (24 %). This distribution is expected and reassuring to find as utility of antibiotics depends on location and purpose of its use. Hence, local policies and consultant input should be paramount in the decision making process to prescribe these drugs. Only 8 % used knowledge obtained during medical school to help prescribe antibiotics. While theoretical knowledge of antibiotic utility is important to formulate a prescription, with ever emerging resistance patterns in hospitals and communities, it is even more important to stay up to date with antibiotic

prescribing hence using, updated local pharmacy/departmental policies [5].

In addition, around one-third of NCHDs prescribes night sedation and anti-emetics based on local pharmacy/departmental policies (33 and 28 %, respectively). For cost reasons, this is reassuring as departmental policies and local protocols usually incorporate cheaper generic options with a solid evidence base making safer and cheaper prescribing easier for junior doctors [6].

Knowledge obtained during medical school

Knowledge obtained during medical school influenced a total of 20 % of prescribing of NCHDs in Ireland. The drugs whose prescription was most influenced by knowledge obtained during medical school were anti-emetics (35 %), night sedation (35 %) and analgesics (29 %).

Also as demonstrated from Table 2, postgraduates use more knowledge obtained during medical school to formulate their prescribing habits than undergraduates (34 vs 14 %, $p = 0.046$). On the other hand, a fewer postgraduates used local policies to shape their prescribing than undergraduates; however, the difference was insignificant (12 vs 28 %, $p = 0.068$). This begs the question if there are any differences in the education delivered in postgraduate and undergraduate colleges that better readies postgraduates for clinical work? Undergraduates appear are more heavily reliant on local/departmental policies, whereas postgraduates seem more concrete in their medical knowledge obtained during university and can prescribe more readily based on this. This is an area that would require more detailed research and would be of value to educators to note if postgraduate and undergraduate education systems differ or is it the students themselves that are 'older and wiser' thus, using their own knowledge accumulated during education to prescribe. It raises the question then, are they more focused during their medical school studies usually having taken a mature decision to study medicine and invested more time and so heavily financially. This focus can be seen after qualification as well and reflected in higher retention rates of junior doctors who entered at a postgraduate level [7, 8].

Pharmaceutical representative

Pharmaceutical representative influence accounted for 13 % of overall prescribing of NCHDs in Ireland. Incredibly, this was only 1 % less than evidence-based prescribing. We can see from Table 1 that the drug prescription most influenced by the pharmaceutical representative was proton-pump inhibitors (PPIs) (33 %). This is critical information as for PPI therapy alone, over €88 million was claimed under the HSE Primary Care Reimbursement Services (PCRS) scheme in 2007 [9]. Hence, junior doctors are being swayed by pharmaceutical representatives into prescribing at the cost of millions of euro by the HSE and Irish government. For cost-saving measures, this must be addressed as a matter of urgency and sensible generic prescribing introduced to combat these spiralling costs. American studies into the switching of trade name drug formulations to generic types have shown a potential annual saving of billions of dollars nationally [10]. On a smaller scale in Ireland, generic type prescribing for PPI therapy alone has been shown to have the potential cost saving of over 5 million euro a year [11, 12].

Other drugs heavily influenced by the pharmaceutical representative were anti-coagulants (28 %) and statins (15 %). Alarmingly, other research has shown a huge discrepancy between estimated generic and brand name costings for statin therapy in Ireland. A potential 40 million euro of savings could be met if these anti-cholesterol medications were prescribed using an appropriate generic formulation [12].

Evidence

One of the most important factors in prescribing is the use of an evidence-based method; however, evidence-based medicine only accounted for 14 % of junior doctor prescribing. The drug most influenced by evidence-based prescription was analgesia (21 %), closely followed by night sedation (20 %) and anti-emetics (18 %).

Examining Table 3, we can see that registrars use more evidence-based prescribing than interns and SHOs (28 vs 10 vs 10 %, $p = 0.03$). Moving across Table 2 from left to right also highlights career progression and shows a trend (however, insignificant) that as NCHDs progress through their careers the influence of the consultant, local policies, and knowledge obtained during medical school wanes. We can extrapolate and hypothesise from these data that these are replaced with evidence-based prescribing. This is reassuring that as doctors' progress through their careers evidence-based prescribing becomes more important and influential in prescribing habits given its proven benefits [13]. It does, however, suggest that more efforts must be made to inform junior doctors of evidence that exists and how to incorporate it into daily practice. One possible solution would be to increase journal club frequency for junior staff as this allows them to keep up with the rapidly enlarging volume of medical literature and evidence [14]. In addition, more protected study time for junior trainees would allow evidence appraisal and further learning.

Limitations

One important element of prescribing that this project did not obtain data and results for directly is cost. One important question that must be asked to doctors of all positions in Ireland is the influence of (or lack of) cost on their prescribing. With patients footing the bill, many doctors may be unaware of the financial implications of their prescribing. In addition, as many junior doctors rotate between institutions, they may not receive patient feedback on their prescribing and cost implications. This would differ from general practitioners and in-hospital consultants where continuity of care is preserved. Thus, it would be interesting to see if these two previous groups are more influenced by cost-effective prescribing than junior doctors.

As this study only sampled a small fraction of the Irish NCHD community, its results cannot be generalised to all of the junior doctors in Ireland. It could, however, be used as a pilot study to promote further work in this area. With escalating prescription costs for the health service to deal with, we must endeavour to further understand the influences on prescribing habits of doctors, both junior and senior. Ultimately, we need to better promote the safer prescribing of appropriate generic formulae to optimise cost saving while preserving patient safety and quality of care.

Conclusions

In conclusion, it can be said that the prescription of medications in Ireland by non-consultant hospital doctors varies greatly depending not only on drug group, but it is also affected by the doctors previous education and level of training. This information is key in leading to sensible cost-effective prescribing and the potential for saving millions of euro by the Irish health service. It also paves the way for future work in this area to better understand not only NCHD but consultant prescribing habits as well.

Compliance with ethical standards

Ethical standards All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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