An exploratory study demonstrating the diagnostic ability of healthcare professionals in primary care using online case studies for common skin conditions

Introduction

The NHS Plan in 2000 stated that the health service in the United Kingdom would become redesigned to meet the needs of patients[1]. In order to achieve this aspiration it was suggested that traditional health care professional boundaries would be broken down. It was envisaged that health professionals, other than medical staff, would extend their roles. This would allow them to take on duties which had conventionally been the sole responsibility of doctors. Both nurses and pharmacists would be encouraged to have more clinically focused roles, as illustrated by the introduction of prescribing rights for nurses and pharmacists. In 2000, *Pharmacy in the future*[2] outlined the ways in which community pharmacists are able to help support patients with every day health problems and in 2003 *A vision for pharmacy in the new NHS*[3], stated that pharmacists should be seen as a part of primary care community services and a first point of contact for health care services for patients in the community. Subsequent pharmacy white papers have strengthened the Government's aspirations for the role of pharmacists as a first port of call for patients with health problems through increased minor ailment schemes[4, 5]. Furthermore, the white paper *Pharmacy in England*, suggests that pharmacists and pharmacies are places for "routinely promoting self-care" for patients[5].

One area where there has been limited research and yet a significant demand for primary care support is dermatology. The prevalence of skin diseases in the community is thought to be high and early evidence from a primary care database in England and Wales suggests that 15% of all consultation episodes were for skin and subcutaneous tissue problems.[6] More recently collected information from the same database suggests that nearly 24 % of the population (roughly 13 million people) consulted their GP about a skin problem and skin conditions were the most common reason for patients to consult their GP with a new problem[7]. Although there is little information on the prevalence of skin diseases seen in community pharmacies in the UK, one small study collected data on all consultations for skin problems over a four week period during the summer[8]. This showed an average rate of 1 -2 consultations per day. In a more recent national survey of pharmacists in England and Wales, Tucker explored pharmacists' perceptions on the range of skin conditions they encountered.[9] This survey revealed that dry skin, eczema/dermatitis and thrush were the most common conditions for which pharmacists perceived that patients sought their advice. Furthermore, information from the Proprietary Association of Great Britain shows that nearly one fifth of all over-the-counter sales are for skin care products.[10]

Despite the relatively high incidence of skin disorders, training for healthcare professionals in dermatology is often limited.[11, 12] In a survey of 638 independent nurse prescribers for skin conditions, Courtney et al[13] found that only 6.9% had a post-graduate qualification in dermatology although 67.9% had undertaken study days in dermatology. In a small study of 69 practice nurses, Cox and Bowman found that practice nurses who treated patients reported a lack of confidence in treating scalp scaling in psoriasis and infected eczema[14]. In a similar questionnaire survey of practice nurses, Smoker found that practice nurses lacked

confidence in providing advice on several skin conditions including psoriasis, eczema, pruritus, acne and urticaria[15].

Dermatology teaching in medical schools is variable and an audit of the dermatology content of medical degrees found that some students have little exposure to dermatology.[16] General practitioners are usually perceived as the "gate-keepers" to the NHS although several studies comparing the diagnostic ability of primary care physicians compared to dermatologists suggest that the primary care physicians lack dermatological diagnostic skills. However, many of the studies are from the US so it is unclear how generalizable these findings may be in the UK. One such study found that second and third year medical residents (i.e. qualified doctors undergoing rotational training) compared with visiting medical practitioners, correctly diagnosed patients with skin problems in 43 and 53 % of cases respectively.[17] In a review of studies comparing the diagnostic skills of dermatologists and family doctors, it was found that only 52 % of family doctors correctly diagnosed conditions.[18] Other studies have produced similar findings. In a retrospective study of referrals to a dermatology department, Tran et al found an agreement between general practitioner and dermatologist diagnoses of 45 %[19]. Morrison et al[20] found that dermatologists agreed with Irish family practitioner diagnoses in 54 % of cases. This study also highlighted the fact family practitioners had particular difficulty in diagnosing benign pigmented actinic and seborheoic keratosis (basal cell papilloma) as well as squamous cell carcinoma and melanoma.

Little is known about the diagnostic ability of nurses for skin conditions although there are a few studies exploring the skin cancer screening ability of practice nurses. One study found that practice nurses have adequate knowledge regarding malignant melanoma but did not often conduct skin examinations in practice.[21]

The role of pharmacists in educating patients on skin diseases and in particular, skin cancer has been poorly researched. In an intervention study by Mayer el at, pharmacists were provided with training in skin cancer prevention advice and the incidence of counseling monitored before and post-intervention[22]. The intervention increased the incidence of counseling among patients and the authors suggested pharmacists have a potentially important role to play in skin cancer education. Pharmacists and their staff also have an important role in advising patients with skin problems. In a telephone survey of 416 adults in Victoria, Australia, 27% reported having a skin problem in the past two weeks and pharmacists were the sole source of advice in 19% of cases. A second study considered consumer satisfaction with the advice and treatment provided in pharmacies for patients presenting with skin problems[24]. Among 181 consumers with skin diseases, 58% were found to be satisfied with the advice they received from a pharmacist.

The available literature therefore suggests that pharmacists and their staff may have a potentially useful role in offering advice and treatment to patients with skin problems. Moreover, one recent discrete choice experiment found that patients would prefer self-care when experiencing flu-like symptoms and the preferred source of professional advice would be the community pharmacist[25]. Although no similar studies have been conducted with patients suffering from skin problems, it is conceivable that patients might wish to consult with pharmacists given their high level of accessibility. In addition such pharmacy consultations could represent a viable alternative to an appointment with the GP or practice nurse particularly for the milder end of the disease spectrum. However, in order to give

credence to this role, it is necessary to establish that pharmacists possess the necessary diagnostic skills.
The aim of the present study was therefore to compare how well pharmacists were able to diagnose a number of skin conditions compared with their colleagues in primary care.

Method

The study was conducted remotely at a specifically developed web-site (www.hpdiagnosticstudy.co.uk) that contained a series of 10 case studies prepared by (RT) with input from a consultant dermatologist (AL) and an academic pharmacist (MP). The case studies were independently reviewed by a second consultant dermatologist (SW), a general practitioner with special interest in dermatology, a specialist dermatology nurse and a pharmacist. All the case studies had the same format which included a digital image of the skin condition and a case history. Participants were required to identify the skin condition selecting from 3 other differential diagnoses as well as an option for "don't know". In addition, participants were alerted to the fact that they could not change their answer once selected.

Selection of skin conditions

In a previous study exploring pharmacists' perception of the skin problems they encountered, it was found that the most frequent requests for advice were for eczema, rashes/allergies in adults, fungal infections and warts/verrucae[9]. Consequently, three scenarios which included different rashes or pigmentary change in adults were developed. The first case included was melasma (a disorder of pigmentation) which is very common in Latino females[26]; the second case was pityriasis rosea, which although relatively uncommon, was believed by the patient to be due to an allergic reaction to a detergent product. The final scenario was polymorphic eruption of pregnancy; the most common pregnancy associated dermatosis[27] which in this study presented as a possible urticarial rash. For the other case studies, pitted keratolysis was included since the main differential is tinea pedis, a common fungal infection, whereas the remaining five conditions tinea corporis (commonly known as ringworm), plantar warts (verruca), molluscum contagiosum, basal cell papilloma (a benign wart) and scabies are all relatively common skin problems.

The criterion for inclusion of pharmacists was that they should be based in community practice and nurses were required to be practice-based. All GPs and nurses were recruited through the local primary care research network and pharmacists through local pharmacy networks as well as approaching local colleagues. All participants were sent an electronic invitation to the study (via email with a link to the web site) and given 7 days to complete the test. Upon registering with the site, participants completed a demographic form and were required to provide feedback on a standardized form after each case study. Participants who had not completed the test after 7 days were sent a follow-up reminder by e-mail. Participants who failed to complete after a second reminder were not allowed to continue and another health professional from that group was approached to complete the test.

The answers given by participants as well as demographic details and any feedback were downloaded from the site as Excel® files. All participants received a £10 Amazon voucher as a token payment for agreeing to undertake the study.

The primary outcome measure for the study was the number of correctly identified dermatological conditions by each of the three healthcare professionals. A total diagnostic score was computed by summation of the scores for the individual case studies with a maximum possible total score of 10. The downloaded answer files were anonymous and indicated only the healthcare profession of the participant.

Statistical analyses SPSS (version 19) was used through imported Excel® files. Since the groups were not matched at baseline, analysis of covariance (ANCOVA) was used to compare total diagnostic scores and Bonferroni-corrected post hoc comparisons were used to determine whether or not any differences between mean scores were significant. Potential covariates were identified by computing Pearson r correlation coefficients between total diagnostic score and the variable. Where there was a significant correlation between a variable and total diagnostic score, the variable was considered for inclusion as a covariate after testing the homogeneity of regression slopes for the variable in question and the main independent variable, i.e. health professional status.

Ethical approval for the study was sought but deemed unnecessary.

Results

Participant demographics

GPs

The sample consisted of 13 males and 7 females and the mean length of time qualified was 17.3 years (SD 9.5) with a range of 2 to 32 years. Only 6 GPs had undertaken any post-registration training courses in dermatology which included attending industry sponsored meetings (3), approved dermatology courses such as diplomas (2) and one unspecified "other" course.

Pharmacists

The sample consisted of an equal number of male and female participants (i.e. 10) and the mean length of time qualified was 22.5 years (SD 13.6) with a range of 1 – 49 years. Only 8 pharmacists had undertaken any form of post- registration training in dermatology which included a Centre for Post graduate Pharmacy Education (CPPE) course (8) and industry sponsored meetings (3). Note that respondents could select more than one answer.

Nurses

The sample consisted of 20 female participants with a mean length of time qualified of 24.3 years (SD 7.5) with a range of 6 – 37 years. Only one participant reported having undertaken

any post-registration training in dermatology which involved an industry sponsored meeting.

All GPs who enrolled in the study completed the case studies, however, 4 pharmacists and 4 nurses who enrolled did not complete and hence other participants from these groups were recruited. In total 60 participants completed.

Total diagnostic scores

The Pearson correlation coefficients, r between total diagnostic score and potential confounders are shown in Table 1. From this table, three variables, post-registration further training in dermatology, gender and previous exposure to the condition were significantly correlated with total diagnostic score and considered for entry as covariates into the ANCOVA model. In fact the significant association between diagnostic score and previous exposure to the condition remained after controlling for gender, health professional status and further training in dermatology ($r = .30$, $p = 0.025$). The total diagnostic score was significantly higher for males (mean score = 8.45) compared to female (mean score = 6.66) participants, $t(58) = 3.31$, $p = 0.002$. In addition, total diagnostic score was higher for those with post-registration training in dermatology (mean score = 8.42) compared those without any further training (mean score = 6.97), $t(58) = -2.24$, $p = 0.029$.

A preliminary analysis evaluating the homogeneity-of-regression indicated that the relationship between the potential covariates identified above and the dependent variable did not differ significantly as a function of the independent variable, except for previous exposure to the skin condition. Consequently, only gender and further post-registration training in dermatology were included as covariates in the ANCOVA model.

The mean diagnostic scores for each of the three health professional groups are shown in Table 2. The difference in diagnostic scores between health professionals was significant, $F(2, 55) = 11.67$ $p < 0.001$. Post hoc tests using a Bonferroni correction revealed that the difference in mean scores was significant ($p < 0.05$) between GPs and both pharmacists and nurses. In addition, the covariate post-registration training in dermatology was also significantly related to total diagnostic score, $F(1, 55) = 5.22$, $p = 0.026$, suggesting that such training had an important effect on the ability to identify skin conditions. The proportion of each group correctly identifying each condition varied to some extent depending on the condition as shown in Figure 1. The results in Figure 1 show that although more GPs correctly diagnosed all conditions, for certain conditions, diagnostic accuracy was comparable for each group. All health professionals appeared to have difficulty recognising the base cell papilloma (case 10).

Discussion

This appears to be the first on-line study to explore the comparative diagnostic ability of primary care healthcare professionals for a range of skin conditions. Although based on a comparatively small sample, the preliminary results suggest that for the conditions included, the diagnostic ability of GPs is, on average, higher than either nurses or pharmacists (Table 2) even when accounting for the effects of potential confounders. Nevertheless, there is some degree of variability across the different conditions are shown in Figure 1. For example, the majority of pharmacists were able to correctly identify scabies, plantar wart (verruca) and tinea corporis (ringworm). Furthermore, the results suggest that with the exception of basal cell papilloma, at least 40 per cent of the pharmacists were able to successfully identify all the other conditions. Conditions such as polymorphic eruption of pregnancy (which was described in the case study as a possible example of urticaria), pityriasis rosea and melasma are relatively uncommon skin problems which were included to challenge the diagnostic skills of participants. The ability of practice nurses to identify the skin conditions was similar to pharmacists in most cases with the possible exception of tinea corporis and this similar ability is reflected by the mean diagnostic scores as shown in Table 2. Case study 10 (basal cell papilloma) appeared to pose diagnostic difficulty for all three groups with the correct diagnosis recorded for only 60 per cent of GPs and less than 30 per cent of nurses and pharmacists. This was somewhat surprising given the potentially high prevalence of the condition.[28] Nevertheless, difficulties in the recognition of skin lesions particularly by GPs has been reported previously[20] although further work is needed to explore the diagnostic ability of pharmacists and nurses in the recognition of common skin lesions.

Post-registration training in dermatology appeared to have a positive impact on diagnostic scores suggesting the potential importance of further training. The fact that mean diagnostic scores were significantly higher for male compared to female participants is probably due to the fact that the sample contained more male participants who were GPs which, as shown in Table 2 had higher mean scores. Moreover, the fact that gender *per se* appeared to have an important effect on total diagnostic score may well again reflect the fact that there were more male GPs in the sample. Nevertheless, the impact and relevance of these initial findings require confirmation from a larger sample.

In total 4 pharmacists and nurses started the study but failed to complete all 10 case studies. The reasons why these participants did not finish is unclear but might due to a lack of knowledge. This would clearly be an important outcome in a larger study and would be investigated further through the use of qualitative interviews which may well identify a training need to improve these participants' confidence.

On several occasions the Government have supported a first port of call role for minor ailments for community pharmacists[4, 5] and a wider role for nurses in healthcare provision[28] to reduce the burden on GPs. The findings in the present study suggest that pharmacists are likely to be a suitable first port of call for advice for patients presenting with these skin

conditions, particularly given the fact that more than 40 per cent of pharmacists correctly identified each skin condition.

Although pharmacists might represent a potentially useful first port of call for patients presenting with the conditions included in this study, the available evidence suggests that pharmacists are not the publics' preferred source for healthcare advice. In a cross-sectional survey of 10,000 adults aged over 35, Boardman et al found that of the 40 per cent who had purchased an over-the-counter product in the last month, only 12 per cent had sought advice[30]. In contrast, a street survey of 300 people by Krska and Morecroft[31] found that 65 per cent had asked for advice in pharmacies on health or medicines. In addition, only 23 per cent felt that pharmacies were the best place to seek health advice.

This study does have some recognised limitations. The small sample size restricts the generalizability of the findings and further work with a larger sample is required to confirm these initial results. Also we cannot be sure that participants did not take time out from the test to research answers. However, as discussed earlier, we attempted to control for this by making it impossible to modify answers and participants had no prior knowledge of the conditions included or questions that were asked. We were also unable to record how long participants took to complete a particular case study although in feedback after each case study, participants were asked to state how long it had taken them to complete the case study, choosing from under 5 minutes, 5 – 10 minutes or over 10 minutes. More than 60 per cent of all participants reported completing the case studies in less than 5 minutes although we were unable to verify this. Furthermore, we recognise that in the current study, participants were provided with prompts from the case history whereas in practice, establishing the correct diagnosis requires the health professional to elicit a clear history from the patient and this ability will variable depending on both knowledge base and training. Whether or not pharmacists and nurses possess the necessary skills to elicit an adequate history from patients is clearly important but was not established in this study. However, as noted by Rutter et al using stimulated patients in community pharmacies, pharmacists rarely asked questions related to history taking and it is therefore unclear well pharmacists would perform when presented with such skin conditions in practice[32].

Conclusion

This small study has demonstrated that for all of the skin conditions considered, pharmacist's overall diagnostic scores were significantly different from those of GPs but similar to those of nurses for the conditions assessed. However, further work is required to determine the accuracy of these preliminary findings and more importantly, to establish whether subsequent advice given by pharmacists results in a satisfactory resolution of a patients' skin problem without the need for further medical intervention.

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