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Factors affecting general practitioners' decisions about plain radiography for back pain: implications for classification of guideline barriers – a qualitative study

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Abstract

Background: General practitioners often diverge from clinical guidelines regarding spine radiography. This study aimed to identify and describe A) factors general practitioners consider may affect their decisions about ordering plain radiography for back pain and B) barriers to guideline adherence suggested by such factors.

Methods: Focus group interviews regarding factors affecting ordering decisions were carried out on a diverse sample of Norwegian general practitioners and were analysed qualitatively. Results of this study and two qualitative studies from the Netherlands and USA on use of spine radiography were interpreted for barriers to guideline adherence. These were compared with an existing barrier classification system described by Dr Cabana's group.

Results: The factors which Norwegian general practitioners considered might affect their decisions about ordering plain radiography for back pain concerned the following broader issues: clinical ordering criteria, patients' wishes for radiography and the general practitioner's response, uncertainty, professional dignity, access to radiology services, perception of whether the patient really was ill, sense of pressure from other health care providers/social security, and expectations about the consequences of ordering radiography. The three studies suggested several attitude-related and external barriers as classified in a previously reported system described by Dr Cabana in another study. Identified barriers not listed in this system were: lack of expectancy that guideline adherence will lead to desired health care process, emotional difficulty with adherence, improper access to actual/alternative health care services, and pressure from health care providers/organisations.

Conclusions: Our findings may help implement spine radiography guidelines. They also indicate that Cabana et al.'s barrier classification system needs extending. A revised system is proposed.

Background

Clinical practice often diverges from clinical practice guidelines and this is particularly well illustrated by general practitioners' (GPs') referrals for plain radiography of

the lumbar spine. Based on data obtained in different countries [1–4], up to 60% of such referrals may not conform to documented guidelines [5–8] (Table 1). Various efforts have reduced referral rates by 0 – 20% and have not

Table 1: Clinical guidelines for use of lumbar spine imaging

International guidelines advise no imaging for acute low back pain that has lasted < 4 to 6 weeks [5–8] and no [5,7] or optional [5] imaging for chronic low back pain, unless one or more "red flags" are present (increased chance of serious disease). Such "red flags" or clinical criteria for lumbar spine imaging include [1–8]:

- Age at onset of pain < 20 years or > 55 or 50 years
- Non-mechanical pain: constant/increasing, not better in rest
- Thoracic pain
- Generally unwell, weight loss
- Major trauma, history of cancer
- Steroid use, immunosuppression, drug abuse
- Widespread neurological signs or symptoms
- Structural spinal deformity
- Marked morning stiffness for > one hour
- High erythrocyte sedimentation rate (> 20 mm/hr)

been shown to lower the proportion of non-conforming referrals [4,9,10].

Changing clinical practice requires an understanding of the factors that affect it [11,12]. Quantitative studies [13–16] indicate that factors affecting GPs' use of spine radiography include clinical data, patient expectations, and GPs' wish to reassure the patients or themselves. However, qualitative studies are also needed to explore the full range of relevant factors and their meaning to the clinician [12,17,18].

Qualitative studies on imaging use are few. We found only one concerning factors affecting GPs' use of spine radiography. This Dutch study [19] suggested that such factors also include time pressure, other health care providers' advice to the patient, and the GP's wish to prevent specialist referral. A study from USA [20] on use of plain radiography, computed tomography (CT) and magnetic resonance imaging for low back pain indicated that expectations from the health maintenance organisation may also play a role.

Factors affecting test ordering decisions and guideline adherence may differ between various imaging tests and health care settings. Many frameworks exist that can be used to classify and compare barriers to guideline adherence [11,21–25]. One developed by Cabana et al. [12] specifically focuses on physicians' guideline adherence and is based on review of barriers actually reported by physicians in studies published up to 1998. However, it is not clear whether this framework embraces the full range of barriers relevant to imaging guidelines since few of these studies were qualitative studies exploring the diversity of barriers and few concerned imaging decisions [12].

Additional qualitative data on GPs' spine radiography decisions may lead to a better understanding of such deci-

sions, suggest barriers to change, add information to Cabana et al.'s [12] framework, and help improve guideline implementation. We set up a qualitative study to identify and describe A) factors GPs consider may affect their decisions about ordering plain radiography for back pain and B) barriers to guideline adherence suggested by such factors.

Methods

Factors affecting ordering decisions

Views and experiences regarding factors affecting ordering decisions were obtained from a diverse, purposeful (non-probabilistic) sample [26,27] of Norwegian GPs. The sample was intended to provide information on the range of views and factors. We wished to sample GPs of different experience and practice type/location as we thought these characteristics might influence which factors were reported. Sampling continued until information redundancy [26], which was achieved after sampling of three separate groups of GPs during a 2-month period in 1998 from a research meeting (four academic GPs from two practices), a National educational course (five GPs from five practices), and a professional meeting (four GPs from four practices). The meeting/course participants were asked to volunteer for a group interview that would be performed immediately after the meeting/course. The sampled GPs (five women, eight men; ages 32–57 years; practice as GP 3–15 years) were from 11 different practices (two solo, nine group; two city, six suburban, three rural) in four different counties of southern Norway.

First author (AE) performed one 90-minute focus group interview [26,28] with each group of GPs after having informed them that he was a radiologist. He explained that the purpose of the interview was to explore the GPs' own thoughts and experiences regarding decisions about and consequences of referring back patients for plain radiography. He then invited the GPs to describe actual cases,

guided a discussion between them, and encouraged further exploration of topics brought up by the GPs themselves [26,28]. No additional background data or list of topics for discussion was presented. The intention was "to gather information based on the participants' interactions" [26]. The interviews were audio-recorded and fully transcribed.

The transcripts were analysed using Giorgi's method as modified by Malterud [29].

1) They were read through to get a general overview of the data and topics commented on.

2) They were scrutinised to identify all text elements on factors affecting decisions about, or on consequences of ordering plain radiography for back pain. Each element was coded according to topic or type of factor/consequence. Codes were derived from the data, not decided a priori [29].

3) Similarly coded text elements were interpreted for a common meaning, which was summarised using expressions close to the GPs' own words. Sub-topics were identified across summaries and given sub-codes. A new summary was made for each sub-code.

4) The GPs' views on factors affecting their ordering decisions were described in more general terms by revising and combining the new summaries, after having re-examined all text elements about consequences (of which many also concerned decisions) to see if/how expected consequences affected decisions. Each description was labelled according to the factors it concerned and was validated by comparing it with the context and data it was based on and by searching the full transcripts for disproving data [26,29]. The final descriptions were illustrated by selected interview quotes (quotes are in *italics*; numbers of GPs with similar views are not given – qualitative studies do not provide reliable quantitative data [27]).

AE did the analysis, putting aside earlier results to reduce their influence on codes and labels. AB (second author) contested and supplemented AE's analysis based on own analysis and review of AE's summaries and results. During the study AE noted own thoughts on preconceptions, study purpose, interviews, analyses and results and discussed sets of such thoughts, metapositions [27], with AB to further improve and validate the analysis.

The analytical method used denied us to develop codes or labels from pre-existing categories or own prior views [27,29]. Our prior views and background may nevertheless have affected our interpretations [29] and are therefore summarised here. We had no prior opinion on how

factors affecting radiography decisions should be classified. AE was a radiologist who thought it appropriate to reduce the number of radiography referrals not conforming to the guidelines. He had previously suggested how issues of importance to patients might be addressed to achieve this [30]. AB was an academic GP with no specific prior interest in why physicians order tests.

Barriers to guideline adherence

Potential barriers were identified from the final descriptions in the Results sections of both the present article and the related qualitative articles from the Netherlands [19] and USA [20]. Cabana et al. [12] described 13 types of knowledge-, attitude-, or behaviour-related (i.e., external) barriers (Table 2, sections 1–3). The current authors 1) independently judged whether each of these barrier types was suggested (yes, uncertain (?), no) by results in each article, 2) solved, by consensus, disagreements on 3, 0, and 3 of the 13 barrier types based on present, Dutch, and American results, respectively, 3) identified additional barriers, and 4) agreed on additional barriers, concepts describing them, and whether they were suggested by results in each article.

Results

Below we present descriptions of factors Norwegian GPs considered might affect their decisions about ordering radiography. These descriptions suggested both barriers and facilitators for guideline adherence. Only barriers were analysed further, see end of section.

Factors affecting ordering decisions

An essential issue was clinical criteria for ordering radiography. GPs considered criteria both for radiography (recent trauma, previous cancer, recurrent symptoms for years, old patient, non-mechanical or intense pain, neurological findings, worsening, no improvement in a month or two) and against it (first episode of pain, radiographs recently taken). In addition, we identified factors concerning eight other issues that might also affect GPs' decisions about ordering plain radiography for back pain. These issues are described below. All of them were mentioned in all of the groups.

The GP's perception of patients' wishes for radiography

GPs said patients often wished radiography because of advice from health care providers (e.g., physiotherapists) or family or because of their symptoms (e.g., intense or long-lasting pain), fear of serious disease or needs for explanation, economical support or illness legitimisation:

...(a radiography referral) is interpreted as a definite signal that the physician thinks it is something physical. It means... that... (the patient) can come home and say, 'I had an X-ray', and then everybody will realise I have pain in my back.

Table 2: Potential barriers to general practitioners' adherence to clinical guidelines for ordering plain radiographs for back pain

Type of barrier based on framework of Cabana et al. [12]	Barrier suggested by qualitative results from			Comments and examples
	USA* [20]	The Netherlands [19]	Norway [current study]	
1. Knowledge-related barriers				
a) Lack of awareness of the CG	?/No	No	?/No	See comment below.
b) Lack of familiarity with the CG	?/No	No	?/No	Barrier may be less important, as GPs' own clinical ordering criteria seemed similar to current CG criteria (all studies). Some GPs were uncertain about criteria for ordering X-rays in addition to computed tomography/magnetic resonance imaging – unclear if this was due to lack of awareness of/familiarity with CG, as these GPs' knowledge of a specific CG was not examined (USA, Norway).
2. Attitude-related barriers				
a) Lack of agreement with the CG	No	Yes	No	GPs' clinical ordering criteria already seemed in line with current CG (all studies, but only the Dutch study reported on agreement with a specific CG). However, Dutch GPs disagreed with a CG presumption that ordering X-rays may elicit medical dependency, exemplifying that 2a) and 2c) may overlap.
b) Lack of self-efficacy needed to follow the CG	No	No	Yes	GPs said they overused X-rays because they lacked clinical skills, suggesting that low self-efficacy may be a barrier (Norway).
c) Lack of expectancy that following the CG will lead to desired patient outcomes	Yes	Yes	Yes	GPs might order X-rays not indicated by clinical criteria if this seemed more likely to lead to desired patient outcomes, e.g., reassurance (all studies), return to work (USA, Norway), economic support (Norway).
d) Lack of motivation to follow the CG or inability to overcome the inertia of previous practice	No	No	No	Not reported.
3. Behaviour-related (i.e., external) barriers				
a) Guideline factors (e.g., inconvenient or confusing criteria)	No	No	No	Not examined (USA, Norway) or not reported (the Netherlands).
b) Patient factors (e.g., preferences that conflicts with the CG)	Yes	Yes	Yes	Patients' wishes for X-rays seemed an important barrier (all studies).
c) Environmental factors related to practice setting				
c1) Lack of time	Yes	Yes	Yes	Included lack of time to negotiate or reassure patients (all studies).
c2) Lack of resources (e.g., lack of educational materials)	No	No	No	Not reported, but related barrier described below (4c).
c3) Organisational constraints (e.g., insufficient staff)	No	No	No	Not reported.
c4) Lack of reimbursement	No	No	No	Not reported.
c5) Increased malpractice liability	Yes	No	Yes	Not reported in the Dutch study.
4. Additional barriers not originally included in the framework				
a) Lack of expectancy that following the CG will lead to desired health care/consultation process	Yes	Yes	Yes	GPs might order 'non-indicated' X-rays to buy time (USA), negotiate (all studies), or build a good relationship with the patient (USA, The Netherlands).
b) Feeling it emotionally difficult to follow the CG	Yes	No	Yes	GPs might order 'non-indicated' X-rays to maintain trust (USA) or limit conflict (USA, Norway), or to end a difficult consultation, reduce own anxiety, or protect own professional dignity (Norway).
c) Improper access to actual/alternative health care services	Yes	No	Yes	Included easy access to actual X-ray services (Norway), and difficult access to physiotherapy (USA) or computed tomography (Norway).
d) Pressure from other health care providers/organisations	Yes	Yes	Yes	GPs might order 'non-indicated' X-rays due to pressure from other health care providers (The Netherlands, Norway) or social security (Norway), or because the health maintenance organisation expected them to satisfy patients but limit use of (other) referral services (USA).

GP = general practitioner, CG = clinical guideline, X-rays = radiographs. * Results on family practitioners' and internists' use of plain X-rays, computed tomography, and magnetic resonance imaging for low back pain; separate results for plain X-rays not reported.

The GP's response of keeping control and trying to help
 GPs' response to patients' wishes for radiography seemed based on the potentially conflicting attitudes of keeping control (*We must be careful not to let the patients dictate...*) and trying to help (*We must take everybody seriously, One's*

schooled to give the best possible service). GPs tended to comply when the patient's wish was strong, the clinical indication for radiography was uncertain, little else could be done, the consultation was difficult, or time was scarce:

Saying 'OK, I'll send you for an X-ray' can bring any awkward consultation to an end.

GPs said responding with straightforward communication, physical examination, and an open-ended referral decision might prevent unnecessary radiography referrals. Communication included rhetoric (*I don't want you to spend money unnecessarily*) and honest arguing against referral after having made up one's own mind. A physical examination might show the patient that the GP's view was well founded (*It can take much longer to argue into empty space*). GPs thought they might further prevent referral by making it clear that they, despite regarding referral unnecessary (now), were willing to refer (now or later):

If the patients feel well examined, and you say 'I cannot, honestly, find anything specific that makes it necessary to take an X-ray... but OK, if you insist I will gladly do it', then many choose to let things be, and... don't feel quite the same need for a radiograph.

Plain radiography might be used as a compromise when patients wished CT. Some GPs reported that experience helped in responding confidently to patients' wishes.

The GP's uncertainty – radiography just to be sure

GPs said they ordered radiography because of own uncertainty related to clinical ordering criteria, anxiety, skills, or possible legal actions. Some GPs were unsure what criteria to use (e.g., for ordering plain radiography in addition to CT) or saw the clinical indication as graded rather than clear (e.g., in cases of minor trauma in elderly women or worsening in persons with varying pain). Other GPs said they were anxious of missing important findings because they had experienced that serious spinal disease could occur rather unexpectedly. Some GPs thought they over-used radiography because they lacked skills in clinical examination:

We have got so much to work with that... many (of us)... will never be any good at examining a back.

GPs also ordered radiography to secure documentation in case the patient claimed for insurance compensation, or to prevent malpractice litigation. Some GPs said increasing experience had reduced their uncertainty.

The GP's professional dignity

GPs expressed a wish to do good work that might both prevent radiography (*I need a proper clinical history and a good physical examination before deciding on radiography*) and induce radiography (*That you don't send them... (to a specialist) ...without having done something yourself*). It implied that GPs valued well-thought-out guidelines and specialist advice (*As long as it is formulated in an orderly way,*

that it is not like 'we'll show you how to do it'), wished to limit costs and X-ray radiation, and wanted their practice to be professionally acceptable.

Access to radiology services

Access to radiology services was said to modify views on acceptable practice, and one GP said increased access to CT services had prevented plain radiography referrals:

I used to feel it was a bit like you should have taken... (plain radiographs) ...if there were no dramatic or very classical symptoms. It's not like that anymore. It's now accepted... to go directly for a CT without necessarily completely clear symptoms.

One GP thought better access to private radiology services made it more appropriate to resist patients' demands for radiography (*They can go themselves and get an X-ray, if they really want to*). Other GPs said better private access increased their use of radiography:

I send those I'm quite sure of finding something on to the Hospital, and to... (the private institute) ...that's mostly to satisfy the patient... Had it not been for the private institute I would most likely have referred fewer.

The GP's perception of whether the patient really is ill

GPs might order radiographs for patients they considered fairly healthy but unwilling to work:

I think of younger men... who you are uncertain about whether they are less motivated for work, or whether they really are ill.... When you need some documentation to show that nothing is wrong... that you can use the normal radiograph to motivate them.

Pressure from other health care providers or social security

GPs said physiotherapists might want radiography before giving (further) treatment, surgeons before evaluating patients clinically, and radiologists before or in addition to performing CT. Social security might request radiography to establish facts before considering (continued) sickness certification or disability pension (*...contributing to an endless dance in the X-ray corridors*). To help patients get further care or economical support, GPs usually complied with such pressures, although they often found radiography unnecessary by clinical criteria.

The GP's expectations about the consequences of ordering radiography

GPs often spoke of consequences of radiography referral when discussing the preceding issues. They expected referral based on clinical criteria to confirm/exclude medical diagnoses, referral caused by uncertainty to reduce uncertainty, and referral in response to a patient's wish to ease the consultation. If the patient feared serious disease,

normal radiologic findings might later reduce the fear, and degenerative findings might provide a useful symptom explanation:

Wear and tear is, in a way, quite nice to have. Most are satisfied with that... nothing dangerous, and nothing that needs surgery. It's a short version of an explanation.

GPs said the decision to order radiography might cause fear of serious illness in some patients. The radiologic findings might later lead to uncertainty in both GP and patient. One GP who was uncertain whether degenerative findings could explain pain was worried she might transfer this uncertainty to her patients. Some GPs said such findings might preserve illness:

... it can come back at me (the GP) like a boomerang: 'now I'm worn out, I can't work any more, I'll go over to social security benefit'.

The impact of expected consequences on ordering decisions seemed to vary. Some GPs said they seldom, others said they often thought of the consequences when making the decision (*I can't remember having taken a radiograph without having wanted to use it in some way...*).

Barriers to guideline adherence

The above descriptions and also the Dutch [19] and American [20] results suggested several barriers related to attitude or behaviour (Table 2, sections 2–3). Four extra types of barriers were identified in addition to those in Cabana et al.'s [12] system (Table 2, section 4). One was attitude-related: lack of expectancy that following the guidelines will lead to desired health care process. One was feeling-related (new main type): feeling it emotionally difficult to follow the guidelines. Two were behaviour-related/external: improper access to actual or alternative health care services, and pressure from other health care providers or organisations.

Discussion

This study had two main findings. First, we identified eight issues other than clinical criteria that may affect GPs' decisions about ordering plain radiography for back pain. These issues were related both to patient (e.g., patient wishes), GP (e.g., GP uncertainty), and their surroundings (e.g., pressure from other health care providers). Second, the study added four new barriers to Cabana et al.'s [12] framework: one concerning process, one feeling-related, and two external.

Strengths and limitations

The quality of our interview study was enhanced by purposeful sampling of GPs of different age, sex, experience, and practice type until information redundancy was

achieved [26] and by focus on actual cases, transcription by the interviewer, analysis by two researchers [27], search for disproving data [29], and metapositions [27]. Our qualitative study explored more issues and GPs' views in greater depth than would be possible in a quantitative study, but it could not show the frequency of each view or exactly how much each issue actually affects decisions.

Group interviews are ideal for exploring common experiences and reasons for actions, but may induce conformity [28]. In our study, similar views seemed mostly due to genuine agreement, as there appeared to be a good tone, high confidence, willingness to share views, and also disagreement in the groups. One-to-one interviews might have disclosed other, more sensitive issues but could have missed common experiences. Observations of clinical encounters might have shown how certain factors (e.g., response to patients' wishes) operate in real decisions, but some factors (e.g., GP anxiety) could be difficult to observe. There may be factors the sampled GPs were unaware of or unwilling to report, but the broad range of views suggests that the most relevant factors have been illuminated.

Our analysis of barriers was based on an explicit barrier classification system [12]. The Results sections [[19,20] present study] we analysed are fully available for others to re-analyse. Analysis of results from three different countries increased the relevance of our findings. These results describe physicians' views, which may not accurately reflect how problematic a barrier actually is [12]. Furthermore, barriers to guideline adherence (e.g., patient pressure) may, in different situations, facilitate adherence [12]. Finally, since no relevant guideline was presented to (or had been implemented among) the physicians in USA [20] and Norway, guideline-related barriers could not be examined (Table 2; 3a).

Discussion of findings

That patients' wishes for tests affect test-ordering is nothing new [30,31], but it is important to distinguish between the actual wish and the physician's perception of it. The latter (which this study is about) may differ from the former [32].

Physicians' responses to patients' wishes for tests are less studied, but appear to depend on trust [20], emotional climate, and available time [19,20]. Our study further suggests that GPs balance their responses between a need for control and a wish to help their patients. It also indicates that in order to prevent radiography referral, some GPs respond by physical examination and a clear advice against referral but with willingness to refer. This response was said to satisfy patients and take little time but it did not address the patients' reasons for wishing radiography, which may also be important [30,33]. The GPs seemed

Table 3: A revised version of Cabana et al.'s framework for classifying barriers to physicians' guideline adherence

Type of barriers	Physicians typically diverge from a guideline because they:
Knowledge-related	
Lack of knowledge of the guideline	Don't know (and don't already use) its decision criteria
Attitude/feeling-related	
Lack of agreement with the guideline	Disagree with the guideline, thinking that it
-lack of agreement with its decision criteria	-has faulty decision criteria
-lack of outcome expectancy*	-worsens (or doesn't improve) patient outcomes
-lack of process expectancy*	-worsens (or doesn't improve) health care process
Lack of feelings expectancy*	Think it provokes difficult feelings
Lack of self-efficacy†	Don't think they have competence to follow it
Lack of motivation/inertia of previous practice	Aren't motivated to follow it or to change habits
External	
Guideline-related	Consider the guideline unclear or impractical to use
Patient-related	Perceive pressure from patients to diverge
Setting-related	Think their practice setting makes them diverge due to:
-lack of time	-insufficient time to inform or negotiate with patients
-lack of other practice resources	-insufficient materials, staff or reimbursement
-increased costs	-increased costs if the guideline is followed
-increased malpractice liability	-risk of legal actions
-pressures in the health care system	-pressure from other health care providers/organisations
-improper access to health care services	-too easy/difficult access to actual or alternative services

Based on original framework [12] and results in Table 2. * Outcome-, process-, or feelings expectancy is the belief that a given behaviour will lead to a particular outcome [12], process, or feeling, respectively. † Self-efficacy is the belief that one can actually perform a behaviour [12].

aware of most such reasons [30], but apparently did not explore them in the individual patient.

Our results on GP uncertainty agreed with earlier quantitative findings [13] but provided new information by suggesting four aspects of uncertainty (related to clinical criteria, GP anxiety, skills, and chance of legal actions). None of these were reported in the Dutch study [19], which concerned back pain management in general and not only radiography. Uncertainty is common in primary care and may also affect use of specialist referrals [34] and laboratory tests [35].

Professional dignity, embracing the wish to do proper or, at least, acceptable work, has not been focused on in earlier reports. It seemed to adjust GPs' practice according to professional views on acceptable radiography use. Previous results suggest that local practice can considerably influence physicians [36].

Access to radiology services reportedly affected prevailing views on acceptable radiography use. Apparently, better access to radiology services did not necessarily imply increased use of plain radiography for back pain. Earlier findings indicate that limited access to other referral services may increase the use of imaging [20].

Table 4: Examples of how barriers to changing professionals' behaviour or guideline adherence can be classified

Revising Cabana et al.'s [12] system, Espeland and Baerheim [current study] related barriers to*	Oxman and Flottorp [22] related barriers to	Thompson et al. [24] related barriers to	Grol [21] related barriers to	Mäkelä and Thorsen [23] related barriers to
Knowledge	Knowledge and attitudes	Information management	Individual clinician	Professionals
Lack of knowledge of the guideline	Clinical uncertainty	Clinical uncertainty	Knowledge	Knowledge
Attitudes/feelings	Sense of competence	Sense of competence	Skills	Skills
Lack of agreement with its decision criteria	Compulsion to act	Standards of practice	Attitudes	Attitudes
Lack of outcome expectancy	Information overload	Financial disincentives	Habits	Patients
Lack of process expectancy	Prevailing opinion	Administrative issues	Social context	Knowledge
Lack of feelings expectancy	Standards of practice	Perception of liability	Patients	Skills
Lack of self-efficacy	Opinion leaders	Patient expectations	Colleagues	Attitudes
Lack of motivation/inertia of previous practice	Medical training		Authorities	Other resources
External barriers related to	Advocacy		Organisational context	Environment
Guideline (e.g., guideline unclear)	Practice environment		Available resources	Social factors

Table 4: Examples of how barriers to changing professionals' behaviour or guideline adherence can be classified (Continued)

Patient (e.g., patient pressure) Setting - lack of time - lack of other practice resources - increased costs - increased malpractice liability - pressures in the health care system - improper access to health care services	Financial disincentives Organisational constraints Perception of liability Patient expectations	Organisational climate Structures, etc.	Organisational factors Economic factors
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* Possible strengths and weaknesses of this revised system: • Specifically concerns physicians' adherence to clinical practice guidelines [12] • Includes barriers actually reported by physicians in published studies [12] • Specifies several different types of attitude/feeling-related barriers • Separates these 'internal' barriers related to the physician from external barriers • Can be used to examine the relationship between internal and external barriers [40] • Includes lack of process expectancy in addition to lack of outcome expectancy • Explicitly lists guideline-related barriers, which guideline developers can prevent • Incorporates specific aspects of physicians' uncertainty, not a broad category (see text) • Lists attitudes that may underlie a 'compulsion to act', e.g., lack of process expectancy • Does not seem to have been used to classify barriers perceived by non-physicians, as opposed to for example Oxman and Flottorp's system [22,41] • Does not explicitly list specific reasons for internal barriers that can be directly addressed • Only implicitly incorporates medical training, advocacy and opinion leaders as sources of barriers • Concerns only barriers and not facilitators, as opposed to Mäkelä and Thorsen's [23] system, although lack of a barrier can also be a facilitator

The two next issues were not new. Physicians in USA used imaging to prevent 'malingering' [20]. Dutch GPs reported on pressure for radiography from other health care providers [15,19]. So did Norwegian patients who also spoke of pressure from social security [30]. Such pressure was often and hotly debated in our groups and irritated GPs, but how frequently it actually affects decisions remains to be studied.

The last issue embraced two interesting findings: GPs considered the consequences of the ordering decision per se (not only the radiologic findings) and they expected radiography to reassure worried patients who wished radiography. Randomised controlled trials that found no effect of radiography on patient anxiety did not examine this specific patient group [37,38].

The clinical ordering criteria reported in our groups were close to criteria in international evidence-based guidelines [5] (Table 1) even though the GPs signalled no special interests in spine imaging or back care. Others have reported similar findings [14,19].

In line with this, our barrier assessment (Table 2) suggested that lack of knowledge of current international guidelines may be less important than barriers related to attitude or behaviour. It also indicated that uncertainty can be a barrier related to knowledge (uncertainty about ordering criteria), attitude (lack of self-efficacy due to lack of skills), behaviour (chance of legal actions), or feelings (anxiety of missing important findings) (Table 2; 1a/b, 2b, 3c5, 4b).

To establish their framework Cabana et al. [12] identified barriers from 120 quantitative surveys asking a total of 293 closed-ended questions as well as from major themes

in five qualitative studies. From the Results sections of three qualitative studies we further identified four extra barriers, each of which occurred in at least two studies and thus seemed both relevant and well documented (Table 2, section 4). This illustrates the effectiveness of an open-ended qualitative approach.

Implications and conclusions

Four implications of our findings can be mentioned:

1. They may provide a better understanding of how GPs try to achieve acceptable solutions in the face of conflicting pressures and uncertainty. They show that decisions about diagnostic tests not only are a result of GP-patient considerations but also take place in wider societal context.
2. They may help to implement spine radiography guidelines. Clinical practice can be altered by reducing multiple barriers to change [11]. The results in Table 2 indicate that a strategy to change GPs' use of spine radiography should be directed towards GPs, patients, and their surroundings. It should address both attitude-related and external barriers. A review on how physicians' test ordering can be changed supports this conclusion [25]. This review indicated that change can be achieved by addressing at least two of the following three types of factors: predisposing (knowledge, attitudes), enabling (skills, resources, reduction of external barriers), and reinforcing (reward through feedback) [25].
3. Cabana et al.'s [12] system can be revised to include the additional barriers reported here, see Table 3. The revised system may be useful for classifying barriers to guideline adherence as perceived by physicians. Possible strengths and weaknesses of this system compared to other ways of

classifying barriers are listed in Table 4. Different classification systems that look at barriers from different angles may provide complementary insights.

4. An instrument for measuring perceived barriers to guideline adherence could be developed based on the revised system (Table 3). Further quantitative data regarding the frequency and importance of identified barriers could help to pinpoint the most relevant barriers [39], compare barriers between settings, and design/evaluate interventions to improve guideline adherence. Table 3 (right-hand column) provides an extended list of physicians' reasons for non-adherence. This list may facilitate the development of a measurement questionnaire.

In conclusion, the present qualitative study helps to explain why GPs diverge from guidelines on spine radiography. It also provides a revised system for classifying barriers to physicians' guideline adherence in general.

Competing interests

None declared.

Authors' contributions

AE conceived of the study, participated in its design, carried out the interviews, analysed the data, and drafted the manuscript. AB participated in the design of the study, analysed the data, and participated in drafting the manuscript. Both authors read and approved the final manuscript.

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