



The reassuring potential of spinal imaging results: development and testing of a brief, psycho-education intervention for patients attending secondary care

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Received: 28 July 2017 / Revised: 7 November 2017 / Accepted: 7 November 2017 / Published online: 17 November 2017
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Abstract

Purpose To develop and test a standardised method of interpreting spinal imaging findings in a manner designed to reassure patients with low back pain and promote engagement in an active recovery.

Methods A five-phase development and testing process involved collaborative working party contributions, informal and formal appraisal of the intervention content by clinicians and consumers, a two-stage online evaluation of the take-home patient resource, and onsite testing.

Results A total of 12 health professionals and 77 consumers were included in formal evaluative processes at various stages of the development and testing process. Consumers assessed the revised iteration of the take-home resource to be clearer and easier to understand than the original version. We integrated all feedback and evaluation outcomes to develop the final intervention content, which was approved by experienced clinicians and considered safe. We devised a framework to guide delivery of the low-cost clinical intervention and a 10–15-min timeframe was demonstrated to be realistic.

Conclusions We have developed, modified, and tested a pragmatic framework for a brief, psychoeducational intervention. We have established face validity and acceptability from key stakeholders and engaged clinicians and are ready to proceed with a pilot feasibility trial.

Keywords Low back pain · Reassurance · Spinal imaging · Education · Intervention

Introduction

Current guidelines for the clinical management of patients with low back pain (LBP) recommend providing information and advice as a principal strategy [1–4]. Patients should be informed about the likely benign nature of their condition and its generally favourable prognosis. This information is

intended to reassure patients and combined with tailored activity guidance, endeavours to facilitate optimal recovery through an early return to usual employment and/or activity. Effective patient reassurance is likely to be an important outcome of clinical consultations for patients with LBP [5–7] and has been demonstrated to have lasting effects [8]. However, despite this consensus, how best to reduce patients' back-pain-related fears and concerns and positively impact associated behaviours remains unclear.

Medical tests and investigations might be expected to alleviate patient concerns, but the available data appear conflicting. A systematic review [9] concluded that diagnostic testing did not reduce illness-related concern for conditions unlikely to have a serious cause, and suggests that medical practitioners are likely to over-estimate the reassuring potential of investigations. In contrast, diagnostic coronary CT angiography has been demonstrated to positively impact patient illness perceptions, and a randomised controlled trial found that neuroimaging for chronic daily headache reduced patient worry and decreased long-term healthcare costs [10].

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s00586-017-5389-8>) contains supplementary material, which is available to authorized users.

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With respect to investigations for adults with LBP, receiving early spinal imaging is not helpful [11, 12]; it may increase and prolong disability [13, 14], increase healthcare costs [14], and be associated with a lesser sense of well-being [12]. In light of these potential outcomes, evidence that many imaging findings routinely reported as ‘abnormal’ are actually ‘normal’ should be considered [15–18]. A recent systematic review of imaging features in asymptomatic adults found that degenerative features were common [15], suggesting that these findings should be interpreted as signs of normal ageing rather than pathology. In addition, few consistent associations between imaging findings, clinical presentation and longer-term outcomes have been identified [19, 20]. The practice of reporting age-related, ‘incidental’ features, without sufficient interpretation, may well be misleading and provoke unnecessary worry and concern.

Even though guidelines recommend against routine imaging for LBP [21], LBP patients routinely present to spinal outpatient clinics with spinal images and associated reports. Most patients hold some conception that their pain is the result of abnormal degenerative changes or structural pathology, and more than 50% of patients report that their activity levels have been influenced by their scan findings [22]. We took the pragmatic step of exploiting imaging results for clinical benefit, conceding that imaging has most often already been undertaken prior to referral to secondary care.

Consultations taking place in a metropolitan hospital outpatient department—as in all clinical encounters—involve clinicians with varied skills, understanding and communication styles. Spinal images are routinely reviewed and discussed in the current setting; however, the extent to which clinicians contextualize the findings and explain their relevance is likely to differ. This has been demonstrated for both general practitioners and spinal surgeons, who provide varied recommendations to LBP patients with regard to their need for imaging and for activity restriction [23]. These recommendations may be influenced by clinician perceptions of condition severity, but also by their own attitudes and beliefs [23–25]. A need for the consistent delivery of high-quality information to LBP patients has been identified [21]—prompting consideration of the potential for careful clinician-led conversations about imaging results to enhance routine practice.

We aimed to develop and test a standardised method of delivering reassuring information intended to influence patients’ beliefs towards a positive valence and promote engagement in an active recovery. Finalising a framework to guide consistent practice related to the interpretation of imaging findings was a key objective of this research.

Methods

Approval for all stages of this research was granted by the Research Ethics Committees at the Royal Adelaide Hospital (RAH) (R20150308HREC/15/RAH/73) and the University of South Australia (0000034887).

Concept genesis

Preliminary discussions with clinical colleagues identified the potential for patients’ concerns and self-imposed activity restrictions to be positively impacted by careful explanation of spinal imaging results. The principal goal of the intervention was to influence patients’ understanding of their condition such that activity and exercise were considered safe and necessary for optimal recovery. Three key content areas for development were identified:

- (i) Imaging (re)interpretation.
- (ii) Contemporary pain understanding, and
- (iii) Activity promotion.

Development of the intervention involved consideration of contemporary conceptual change theory [26]—describing a process in which old, previously learned information is replaced by a revised construction of knowledge. This change process requires appreciation of the prior beliefs and understanding of the ‘learner’ and their motivation to engage with new information. While it has been suggested that the existence of ideas that are inconsistent with new concepts can impede or distort new learning [27], a meta-analysis of 70 studies has shown that contrasting new concepts with common misconceptions (rather than an individuals’ own misconceptions) can facilitate comprehension of new concepts [28]. We considered this evidence while devising the information content and the manner in which it would be presented to patients. Of key importance was that the new knowledge (related to the three key content areas noted above) was both compelling and ‘made sense’. We required a pragmatic approach with regard to duration of the intervention, feasibility of integrating it into standard secondary care consultations, and costs of resources.

Phase 1: establishing intervention framework and core content

A collaborative working party involving a clinical neuroscientist and pain educator, an Occupational Physician, an experienced Physiotherapist, and the principal investigator discussed the concept and content of the intervention. We constructed an initial curriculum around the following key concepts: common patient beliefs/misconceptions; content scope; complexity of information; engagement strategies;

foreseeable risks; format of information delivery; acceptability and feasibility. Justification for the key concepts discussed and specific working party objectives are provided in Supplement 1.

Phase 2: clinician and consumer engagement

We engaged a panel of clinicians and consumers to review and discuss the initial draft of the intervention. The clinicians were a Consultant Neurosurgeon at the RAH Spinal Unit (YHY), the Lead Physiotherapist at the RAH Spinal Assessment Clinic (MDB) and a Senior Physiotherapist at the RAH (SV). The consumers were a patient attending the RAH Spinal Assessment Clinic, a patient with LBP and recent spinal imaging from the University of South Australia Physiotherapy Clinic, and an adult with a recent history of LBP who was not engaged clinically with the RAH or the University of South Australia. A final draft of the intervention framework called ‘Green Light Imaging Interpretation to Enhance Recovery’ (‘GLITtER’) was produced.

Ten health professionals were emailed the GLITtER outline along with a formalised questionnaire (adapted from McGregor et al. [29]). Participants were asked to offer general feedback, as well as provide specific comments relating to content, detail, format, usefulness, and acceptability. In addition, we asked one Orthopaedic Surgeon and one Neurosurgeon to respond to the question: “In your opinion, does the GLITtER intervention present any foreseeable risk to the patient?” Affirmative responses triggered a request for further detailed information regarding any potential risk.

Phase 3: development and production evaluation of the ‘take-home’ resource

A graphic artist (YM) was engaged to assist with the artwork for a take-home resource. Priority aspects of this resource were ease of use, clarity and accuracy of content, cost of production, and inclusion of an interactive component. Four A4 poster-style pages were produced and labelled weeks 1–4. The information was printed on the front and back of an A3 poster sheet (2 on each side), folded down the centre, with the intention that the information be displayed 1 week at a time. Each page, and thus each week, included a specific task and directed patients to a link to online information coherent with the educational content. Weekly SMS messages containing links to the suggested online resources and prompts to read/change their poster were devised to enhance engagement.

Consumer perspectives were evaluated via an online questionnaire developed using Web-based survey software [30]. Participants were eligible if they were aged over 18, had a history of back pain and had received spinal imaging during the previous 12 months. Recruitment occurred via

advertisements placed on selected websites and/or newsletters associated with Chronic Pain Australia, the Australian Pain Management Association and BodyinMind.org. Participants responded to the invitation by following a link to an information sheet and consent was confirmed by voluntary commencement of the survey. The educational material was displayed, and participants were asked to complete a two-page evaluation (see Supplement 2).

Phase 4: onsite convenience testing

Short-term effects associated with the intervention (including patient understanding, reassurance and kinaesiophobia) were evaluated in a convenience sample of patients attending the RAH Spinal Assessment Clinic. The criteria for inclusion in this study are detailed in Table 1. Participants completed signed consent forms, the Tampa Scale for Kinaesiophobia (TSK), and three ‘Reassurance Questions’ (see Supplement 3). The principal researcher then delivered the intervention in a one-to-one interaction, following which the patient was asked to complete a five-item checklist designed to evaluate whether the key messages were successfully delivered (Supplement 4).

Phase 5: integration of feedback, testing outcomes, and content revision

The principal researcher integrated all clinician and consumer feedback, along with outcomes from the onsite testing to finalise the content of the intervention and a framework to guide clinical delivery. The take-home resource was revised according to key findings from the online questionnaire. These revisions were retested in a convenience sample of adult volunteers (recruited via targeted email) who were presented with the original and revised versions via a brief,

Table 1 Selection criteria for onsite testing

Inclusion criteria
Adults 18–75 years
Able to speak and understand (spoken and written) English
Attending appointment in the spinal assessment clinic at the RAH for assessment of low back pain (with or without leg pain/symptoms)
Present to appointment with a recent (past 12 months) CT scan or MRI
No requirement for further imaging or investigation
No indication for review by a spinal surgeon
Exclusion criteria
Patients with a history of spinal surgery
Red flags suspected or identified (in referral or patient consultation)
Pregnancy
Identified cognitive impairment or psychopathology

online questionnaire, and asked to provide specific feedback on both versions (see Supplement 5).

Results

Health professional evaluation

Ten health professionals (six males and four females) completed detailed evaluations. One was an Occupational Physician, and nine were Physiotherapists. Six of the Physiotherapists were employed in musculoskeletal clinical practice. All respondents described the information as useful, clear, and likely to be well accepted by patients. Suggestions regarding wording led to some minor revisions (e.g. the ‘C’ in the TICK list (see Supplement 6) was changed from ‘Commence gently’ to ‘be Consistent’). There were some concerns relating to the short duration of the intervention and the generic nature of the content. Respondents suggested that these factors may impact clinician–patient rapport, the believability of the information, and achievement of the intervention aims. One respondent also identified the need to ‘target’ the intervention to patients for whom the information is likely to be most relevant. This led to the development of a brief eligibility checklist (see Supplement 7) to be completed by clinicians following patient assessment. Two spinal clinic Consultants at the RAH appraised the GLITtER content for safety and confirmed no foreseeable risks.

Online consumer evaluation of the take-home resource

Fifty-three adults completed the online questionnaire evaluating consumer perspectives on the take-home resource. 20% of participants were aged < 30 years, 57% were aged 30–50 years, and 23% were > 50 years. All reported back pain during the previous 12 months. 84% had received a scan and all of these participants recalled finding out some information about what their scan showed. Previous spinal imaging was an inclusion criterion for this study, but 16% of participants did not strictly meet all criteria. We did, however, consider all participant responses in our evaluation. Responses to the fixed-choice questions are presented graphically in Fig. 1. A summary of the key themes arising from the open-answer questions is presented in Table 2.

Revision and re-testing of the take-home resource

A recurrent theme of the consumer feedback was difficulty understanding the “traffic light” diagram on the ‘Week 2’ page. This led to modification and subsequent re-testing of this diagram. 57% of the 20 respondents who completed this secondary evaluation were not trained in a health-related

field. Composite scores from 3 ratings evaluating message clarity, ease of understanding, and confusion indicated that 56% preferred the new diagram, 17% preferred the old diagram, and 27% rated both diagrams equally. 80% of participants recorded scores of ≥ 8 for clarity and ease of understanding. The finding that 83% of participants regarded the revised diagram as the same or better than the earlier version led us to replace the diagram in the final artwork (see Supplement 6).

Onsite testing

Four patients signed consent forms and were enrolled into this testing phase. All participants completed the pre-intervention reassurance questions and two completed the TSK. (Participant time availability limited completion in two cases). The intervention was delivered by the principal researcher within a 10–15-min timeframe. Post-intervention outcomes indicated that all participants considered that no further scans or surgery was required. Two believed that their scans did not show things they should worry about and that being active does not risk causing more damage. Two remained unsure about whether their scans revealed things they should worry about. One of these respondents felt “unsure” about whether being active could cause more damage, while the other felt adequately reassured that activity was safe. A key insight offered through the onsite testing was recognition of the importance of established patient rapport and clinician credibility. This was reinforced by the health professional evaluations (previously described) and prompted revision of the proposed methodology for subsequent testing of the intervention. Specifically, to maximise believability, perceived relevance, and overall impact, we recommended that the intervention be delivered by the treating ‘specialist’ clinician (rather than an external educator).

What is GLITtER?

An overview of the final framework for the GLITtER intervention is provided in Table 3.

Discussion

We have described a researcher–clinician–consumer collaborative process which has led to the development of ‘GLITtER’—a framework for a clinical intervention offering a standardised method of interpreting spinal imaging findings in a manner designed to reassure patients and promote engagement in an active recovery. We took the pragmatic step of exploiting imaging results for clinical benefit, conceding that imaging has most often already been undertaken

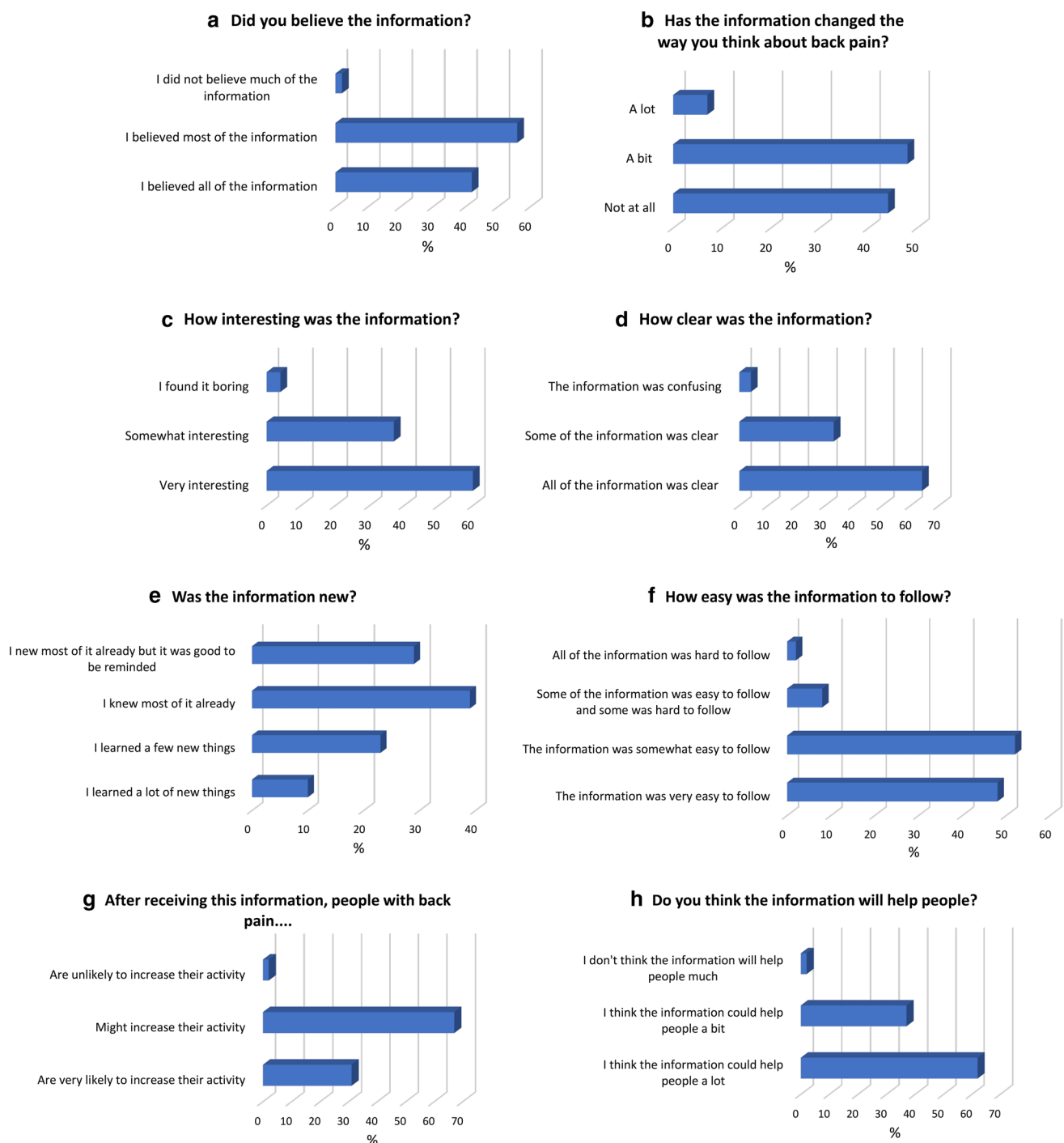


Fig. 1 Online consumer evaluation ($n = 53$). Responses to fixed-answer questions **a–h**

prior to referral to secondary care [31, 32], even though this practice is frequently counter to guidelines [21].

While spinal clinic consultations usually involve providing brief explanations and information consistent with the content of GLITtER, there is likely to be variation in the scope of information routinely provided by clinicians in this setting. Doctors, including spinal surgeons, have been

demonstrated to provide highly variable recommendations to patients with LBP [23], which justifies an approach to address practice inconsistencies and optimise content. We believe that the intervention framework developed in this study is a novel but pragmatically useful approach with the potential to enhance clinical consultations. Spinal imaging results are deliberately used as a clinical tool to facilitate

Table 2 Online evaluation of written information: Summary of themes from open questions

Question	Theme
What do you think were the most important messages? (<i>n</i> = 42)	<ol style="list-style-type: none"> 1. Getting moving is essential. Exercise is important for recovery. Exercise is safe (34) 2. Pain is a protective mechanism. Pain is complex. Pain doesn't necessarily mean further damage. Pain is influenced by general well-being (16) 3. Many structural changes shown on scans are normal. Scans do not usually provide reasons for pain (4)
What did you like most about the information sheets? (<i>n</i> = 41)	<ol style="list-style-type: none"> 1. Easy to follow, easy to read and understand, clear messages, good graphics (27) 2. Colourful, visually interesting, well set out (20) 3. Encouraging messages of hope, increased confidence, a 'place to start' (7)
What did you like least about the information sheets? (<i>n</i> = 39)	<ol style="list-style-type: none"> 1. Would like more information, a little simplistic, some repetition (9) 2. The diagram with traffic lights (week 2) was confusing (6) 3. A bit too busy to look at (5)
Was any of the information difficult to understand? If so, which bits? (<i>n</i> = 40)	<ol style="list-style-type: none"> 1. No, it was very clear (27) 2. The traffic light diagram (week 2) was a bit difficult to understand (5) 3. The diagram about scans (week 1) took a while to follow (2)
Is there further information you would like? (<i>n</i> = 37)	<ol style="list-style-type: none"> 1. No suggestions for further information (17) 2. More detailed guidance for commencing and progressing exercise (8) 3. More information about re-training an over-protective system (4)
Do you have any further comments? (<i>n</i> = 29)	<p>"I have just come back from the physio discussion on my MRI results. I have been in such excruciating pain that I found it very difficult to believe that there was nothing 'wrong' and that I have to get back to exercise. It's difficult to be logical when you have screaming pain! However, I found your info sheets reassuring and helpful"</p> <p>"How do we get doctors and physios and chiro to give the person the green light to move in a very clear way?"</p> <p>"Good ideas and definitely helpful for people to whom back pain may be new and scary. Not so much for long-term sufferers"</p> <p>"It is important to validate people's experience of pain. Just because it may not be represented physically doesn't mean it isn't real. Be careful not to minimise this"</p> <p>"Great resource and could be very useful to get patients thinking about coping strategies"</p> <p>"Fantastic information—could be explained more"</p> <p>"Thanks for doing this research. I've been able to witness how my thoughts impact my pain (when I feel hopeless my pain is way worse), I just don't know the path to help myself"</p>

The number of participants who provided answers to each question is noted (*n*). The number in brackets following each theme indicates the frequency of mention in responses

patient understanding regarding the structural integrity of their spine, its life-long adaptations to load, its inherent strength, and the need for activity to optimise the potential for recovery. Patients are provided with appealingly presented take-home information reinforcing the key messages provided during the clinical interaction, and are also led to online resources for further coherent information (such coherence in messaging is considered important for conceptual change [27]). The potential to update these internet links as further quality resources become available online is considered an important capability.

The intervention was designed to be brief and low cost which are important feasibility considerations. Clinician training is likely to take no more than two, 30-min sessions, which can be readily scheduled as part of routine

professional development. The estimated time required to deliver GLITtER is 10–15 min (over and above the 'standard' consultation). This timeframe takes into account that components of the GLITtER content are already delivered by some clinicians in some situations and allows time for individualised tailoring of the information content and discussion. While the printing of the take-home resource is the only direct cost associated with the intervention, further clinical testing will be required to quantify the impact of extending the duration of consultations on clinic flow.

Evolution of the intervention in response to feedback and testing outcomes has been described. Notably, however, there were some issues raised that did not lead to significant revision. In particular, a recurrent theme arising from the online questionnaire was that participants would like

Table 3 Overview of GLITtER intervention

GLITtER content overview	Total duration
(i) Provide information about ‘normal’ imaging findings, relevant to the patient’s age Involve a visual aid: graph of prevalence of (age-relevant) degenerative features in asymptomatic adults (ii) Explain patient’s imaging findings in detail. Include key messages: Scans (on their own) don’t explain much about: Your current pain—especially why you have good days and bad The activity you are capable of, or How likely you are to recover (because the changes on your scans will still be there when your pain goes away) (iii) Re-interpret imaging findings, highlighting ‘positive’ features. For example Demonstrate spinal features which offer structural stability and emphasise the inherent strength of the spine Demonstrate musculature and joints—structures that need movement to be optimally healthy (iv) Promote using the ‘TICK list’ as a strategy for increasing planned activity/exercise (v) Introduce patient to take-home information (provide magnets for displaying) (vi) Request patient completion of GLITtER checklist. Discuss further if required (vii) Correspond with the patient’s General Practitioner. Include a summary of the key messages provided to the patient within the GLITtER intervention (viii) Send the patient a weekly SMS message (4×) containing A prompt to turn their take-home information to the next ‘week’ Provide a link to the online resource (detailed weekly on the take-home poster)	10–15 min

GLITtER Green Light Imaging Interpretation to Enhance Recovery

more detailed exercise prescription and advice. This was considered to be beyond the scope of this brief intervention, but it does imply that GLITtER triggered enthusiasm for an active approach to rehabilitation. Indeed, it was clear from the feedback that the overarching key message conveyed via the take-home posters was of the importance of being active, and the ‘TICK’ list was viewed positively. There was also criticism relating to the repetition of some of the content. This was an intentional effort to clearly convey the key messages (such repetition in messaging is considered important for conceptual change [27]). The take-home content was designed to be read 1 week at a time (rather than all at once as it was presented in the online survey)—which may reduce the obviousness of the repetition without omitting it and thereby reinforcing important information. We also believe that concerns that were raised about offering a ‘generic’ approach with insufficient attention or validation of individual circumstances will be overcome by the individualised, patient-centred clinical interaction.

We recognise that 16% of the participants who completed the online evaluation of the take-home resource had not received spinal imaging, which was pre-specified as inclusion criteria in our approved protocol. That 3 of the 4 information pages did not have any relevance to spinal imaging findings led us to conclude that the feedback provided by these participants remained worthwhile. We chose to include these participants on the basis of their relevant contribution, prior to commencing any data processing or analysis. The high proportion of healthcare-trained participants involved in the retesting of the online resource (43%) is a limitation of this evaluation phase, since the sample is likely to be poorly representative of the end-users of the product. We

consider, however, that these participants were able to usefully appraise and compare the two diagrams presented.

This manuscript outlines the early development of a clinical intervention which has yet to be tested for feasibility. Our study involved varied methods of convenience sampling at all stages of the process described in this manuscript. While we acknowledge that this may raise some methodological concerns, we consider this approach acceptable for the development stage of an intervention. Alternative (and more ‘scientific’) methods of sampling are appropriate for further feasibility testing.

We have developed, modified, and tested a pragmatic framework for a clinical intervention and have established face validity and acceptability from key stakeholders. Current RAH clinicians have been guided through ‘GLITtER’ in detail and have been invited to discuss the practical aspects of integrating this content into spinal clinic consultations. We are ready to proceed with a feasibility trial of GLITtER (registered in February 2017: <http://www.ANZCTR.org.au/ACTRN12617000317392.aspx>).

Acknowledgements Emma Karran is supported by the Royal Adelaide Hospital Clinical Research Grants (received 2014 & 2015) and the Royal Adelaide Hospital Research foundation Dawes Scholarship. G. Lorimer Moseley is supported by the NHMRC (Principal Research Fellowship ID: 1061279). GLM has received support from: Pfizer Australia, Kaiser Permanente, Results Physiotherapy, Agile Physiotherapy, Workers’ Compensation Boards in Australia, Europe and North America, the International Olympic Committee and Port Adelaide Football Club. He receives speaker fees for lectures on pain and rehabilitation. He receives royalties for books on pain and rehabilitation. The authors wish to acknowledge valuable contributions and cooperation of all who assisted with the stages described in this manuscript. In particular: Gavin Shepherd, Dave Moen, Yvonne Markey, Chronic Pain Australia,

The Australian Pain Management Association, Spinal Clinic staff at the Royal Adelaide Hospital, patients and survey respondents.

Compliance with ethical standards

Conflict of interest All the other authors declare no conflicts of interest.

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