Sensitivity and Specificity of Patient and Provider Reported Red Flags for Back Pain

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Introduction

The spine red flag questions are a screening tool used to help identify patients with potential serious underlying spinal pathologies such as cauda equina syndrome, malignancy, fractures, or infections that would benefit from additional evaluation. This study quantifies the sensitivity and specificity of patient-reported and provider-reported red flags.

Methods

Five hundred patients were randomly selected from the complete sample of 4,313 patients that presented to a spine clinic between October 9, 2013 and June 30, 2014 who received primary care within the health system and who electronically completed a red flags questionnaire. Physician notes were manually reviewed to identify provider-reported red flags and the clinical diagnoses of patient within a one-year window around the index visit; these diagnoses were used as the gold standard for sensitivity, specificity, positive and negative predictive values calculations. Youden's index was used to rank performance of the red flags.

Results

Twenty-six (5.2%) patients were excluded due to cancellations and lack of follow up visits. A history of cancer was the best performing red flag to screen for malignancy in both patient-reported [sensitivity: 0.75 (0.53-0.90), specificity: 0.79 (0.75-0.82)] and provider-reported [sensitivity: 0.92 (0.73-0.99), specificity: 0.78 (0.74-0.82)] settings. The best performing red flags for fractures were osteoporosis, steroid use, and significant trauma in combination together for patient-reported red flags [sensitivity: 0.59 (0.44-0.72), specificity: 0.65 (0.60-069)], and osteoporosis and trauma in combination together for provider-reported red flags [sensitivity: 0.88 (0.68-0.91), specificity: 0.79 (0.75-0.83)]. The prevalence of infection and cauda equina diagnoses in the sample population was insufficient to perform sensitivity and specificity analysis.

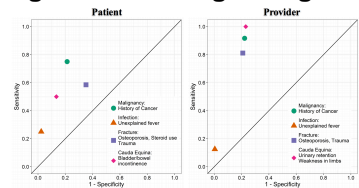### Figure 1: Best diagnostic red flags for each target diagnosis

Figure shows the sensitivity and specificity of patient-reported (left) and provider-reported (right) combinations of red flags. 95% confidence intervals are reported in Table 2 (below). The coordinate (0,1) is the ideal diagnostic tool, with 100% sensitivity and 100% specificity.

Table 1: Best diagnostic red flags for diagnoses for patient and provider-reported red flags

Target	Flags	Patient-reported Sensitivity	Patient-reported Specificity	Provider-reported Sensitivity	Provider-reported Specificity
Malignancy	History of Cancer	0.75 (0.533-0.902)	0.787 (0.746-0.824)	0.917 (0.73-0.99)	0.778 (0.736-0.815)
Infection	Unexplained Fever	0.25 (0.032-0.651)	0.976 (0.958-0.988)	0.125 (0.003-0.527)	0.996 (0.985-0.999)
Fracture	Osteoporosis, Steroid Use, Trauma	0.585 (0.441-0.719)	0.648 (0.601-0.694)	0.887 (0.77-0.957)	0.67 (0.623-0.715)
Fracture	Osteoporosis, Trauma	0.509 (0.368-0.649)	0.713 (0.667-0.755)	0.811 (0.68-0.906)	0.791 (0.749-0.829)
Cauda Equina Syndrome	Incontinence	0.5 (0.118-0.882)	0.865 (0.831-0.895)	0.667 (0.223-0.957)	0.94 (0.915-0.96)
Cauda Equina Syndrome	Urinary retention, Limb weakness	0.833 (0.359-0.996)	0.526 (0.479-0.572)	1 (0.541-1)	0.769 (0.728-0.807)

Table shows the best individual or combination of red flag(s) for detecting target pathologies. Youden's index was used to select thebest performing red flags within each target pathology. 95% confidence intervals are given in parentheses. Cohen's kappa coefficientshows the level of agreement, and 95% confidence intervals, between patient-reported and provider reported red flags.

Table 2: Agreement between patient/provider red flags

Red Flag	Overall Agreement	Kappa	Negative Agreement	Positive Agreement	Prevalence Index
History of cancer	0.895	0.718 (0.645-0.791)	0.930	0.788	-0.502
Night pain	0.576	0.16 (0.102-0.218)	0.690	0.328	-0.369
Pain at rest	0.686	0.035 (-0.032-0.102)	0.808	0.139	-0.635
Difficulty finding position of comfort	-	-	-	-	-
Urinary retention	0.949	0.225 (0.024-0.427)	0.974	0.250	-0.932
Unexplained fever	0.975	0.242 (-0.036-0.521)	0.987	0.250	-0.966
Osteoporosis	0.802	0.419 (0.323-0.515)	0.874	0.539	-0.570
Steroid use	0.806	0.272 (0.161-0.383)	0.885	0.387	-0.684
Trauma	0.873	0.358 (0.232-0.484)	0.929	0.423	-0.781
Bowel/Bladder incontinence	0.857	0.237 (0.114-0.36)	0.920	0.306	-0.793
Saddle numbness	0.945	0.061 (-0.068-0.189)	0.972	0.071	-0.941
Weakness in limbs	0.667	0.31 (0.236-0.385)	0.746	0.515	-0.312

Cohen's kappa coefficient was used to assess agreement. Prevalence indices are mostly negative, indicating more negative agreement between patient and provider-reported red flags than to positive agreement.

Conclusions

- Patient-reported red flags had limited sensitivity and specificity for the identification of serious spinal pathologies.
- Red flags with the best performance were: history of cancer (screen for malignancy) and the combination of osteoporosis, steroid use, and trauma (screen for fractures).
- Given the low sensitivity and specificity of patient-entered red flags in this study, we recommend against their use as a stand-alone screening for red flags in patients presenting with back pain. The results of this study suggests that the use of patient-reported red flags alone cannot replace the clinical judgement of healthcare providers.

References

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