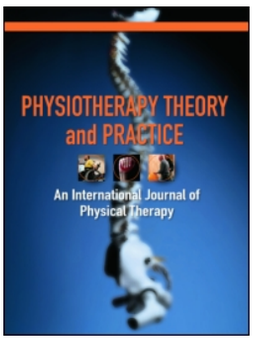

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Improving access in rheumatology: Evaluating the validity of a paper triage process involving an advanced practice physiotherapist through a retrospective chart review

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REPORT

Improving access in rheumatology: Evaluating the validity of a paper triage process involving an advanced practice physiotherapist through a retrospective chart review

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ABSTRACT

Objectives: This study evaluated a standardized paper triage process conducted by an advanced practice physiotherapist (APP) at a rheumatology center. The aims were to (1) determine the concordance between paper triage priority assignment and the rheumatologist's diagnosis; (2) determine the sensitivity and specificity of the paper triage process; and (3) assess reasons for incorrect priority ranking. ***Methods***: Referrals were triaged by a formally trained APP into one of the three priorities, guided by a priority referral tool. A retrospective review of 192 charts was performed. Raw proportion of agreement between paper triage and rheumatologist's diagnosis was supplemented by a prevalence-adjusted bias-adjusted kappa (PABAK). Priority categories were collapsed to calculate sensitivity and specificity. For discordant cases, additional information was collected from the referral and chart to identify potential features leading to discrepancy. ***Results***: Overall agreement was 76%. The PABAK was 0.80 [95% confidence interval 0.70–0.90]. Sensitivity ranged 0.64–0.92 and specificity ranged 0.81–0.94, depending on the priority category. Forty-six cases were discordant, with the APP choosing a higher priority in 37 cases. An incorrect diagnosis from the family physician with no supporting information for the paper triage led to discordance in 16 cases. ***Conclusion***: A standardized paper triage process conducted by an APP showed substantial concordance, sensitivity, and specificity.

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KEYWORDS
Triage; access; rheumatology; advanced practice physiotherapist

Introduction

Rheumatic diseases are currently the leading causes of disability in Canada (Canadian Rheumatology Association, 2014). These diseases negatively impact society, in terms of both fiscal burden on the health-care system and patient quality of life (Arthritis Community Research Evaluation Unit, 2013; Canadian Rheumatology Association, 2014; Leirisalo-Repo, 2013). Individuals with arthritis see more specialists, report more disability, and are more likely to leave the workforce than individuals with any other chronic disease (Arthritis Community Research Evaluation Unit, 2013).

Of greatest concern are immune-regulated rheumatic diseases, such as those falling into the category of inflammatory arthritis (IA) and connective tissue diseases (CTDs). Evidence shows that patients suffering from IA benefit most from disease-modifying anti-rheumatic drug (DMARD) treatment if initiated within the first 3 months of when symptoms first appear, highlighting the importance of a timely diagnosis (Canadian Rheumatology Association, 2014; Carpenter and Katz, 2014; Emery et al., 2002; Finckh, Liang, van Herckenrode, and de Pablo, 2006; Horton, Walsh, and Emery, 2011; Leirisalo-Repo, 2013; Singh et al, 2016). As a result, international standards of practice for maximum wait time before specialist consultation have been implemented at many facilities (Arthritis Community Research Evaluation Unit, 2013; Canadian Rheumatology Association, 2014).

An identified barrier to providing rheumatologic care is the shortage of rheumatologists in Canada (Badley and Davis, 2012; Bykerk et al., 2012; Rohekar et al, 2015). Studies suggest that Canada has an insufficient number of rheumatologists to service the needs of the population, particularly when stratified by region (Barber et al, 2017; Brophy et al., 2016). In Ontario, over a 15-year period, the number of rheumatology patients doubled with no corresponding increase in rheumatologists (Widdifield et al., 2013). This shortage can be expected to have profound implications on the health-care system, especially when considering that the prevalence of arthritis is expected to

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double over the next 20 years (Badley and Davis, 2012). Wait times in some areas of Canada are well above targeted benchmarks (Badley and Davis, 2012). This shortage highlights the need for change within the current system in order to decrease the burden on rheumatologists and improve patient wait times. Two strategies to improve access include (1) improved triage from time of referral to rheumatology to initial consult and (2) the implementation of alternate models of care using extended role practitioners, such as advanced practice physiotherapists (APPs) (Bykerk et al., 2012; Shipton, Badley, Bookman, and Hawker, 2002; Villeneuve et al., 2013).

In many cases, rheumatologists have performed paper triage of referrals demonstrating concordance with outgoing diagnosis (Carpenter and Katz, 2014). Centralized paper triage has been shown to improve access for priority patients, while increasing wait times for non-priority patients (Farrer et al., 2016). Extended-role practitioners, including APPs, have played an integral part in effective triage based on clinical assessment (Farrer, 2013; Hawke et al., 2013; Lundon et al., 2015; Passalent et al., 2013). They have provided triage to specialist care of musculoskeletal (MSK) conditions in the United Kingdom, Australia, and Canada (Badley and Davis, 2012). Desmeules et al. (2012) reported that the care provided to patients by APPs may be as valuable as physician care in regard to treatment effectiveness, diagnostic accuracy, use of resources, and patient satisfaction in an orthopedic setting (Desmeules et al., 2012). Given that accurate triaging has been shown to be an effective method for minimizing wait times for priority patients (Villeneuve et al., 2013), and that APPs have a role in collaborative models of care (Desmeules et al., 2012), it would be beneficial to further assess the accuracy and safety of paper triage, as performed by an APP, as this has not previously been demonstrated. This study evaluated, through a retrospective chart review, a systematic paper triage process carried out by a formally trained APP. Specific objectives were as follows: (1) to determine the concordance between paper triage priority assignment and the outgoing diagnosis by the rheumatologist; (2) to determine the sensitivity and specificity of the paper triage process; and (3) to assess possible reasons for incorrect priority ranking by the paper triage process.

Materials and methods

Setting

Women's College Hospital is an academic ambulatory hospital. The department provides 1709 new patient consultations and 6635 follow-up visits annually. Patients with IA or CTD constitute priority patients, with ongoing management of osteoarthritis (OA) and non-inflammatory MSK issues also provided. The department has adopted a model of care involving an APP and a centralized paper triage process. The APP has academic and clinical training in the assessment and management of rheumatologic conditions through the Advanced Clinician Practitioner in Arthritis Care program (ACPAC) with 7 years of work experience within the team. The ACPAC program provides extended knowledge in the assessment, diagnosis, triage, and management of individuals with arthritis, including the interpretation of laboratory results and imaging (Lundon, Shupak, Schneider, and Herold McIlroy, 2011).

Sample

A retrospective chart review was conducted on patients (≥18 years old) that were triaged by the APP at the urban academic rheumatology clinic between April 1, 2013 and March 2, 2015. Exclusion criteria included the charts of patients who were referred but not subsequently seen by a rheumatologist, charts that did not include a rheumatologist note, charts that were triaged by a different health-care professional (HCP), and urgent referrals (Fitzgerald et al., 2011) that bypassed the triage system. The center receives, on average, two urgent paper referrals per month. In this situation, the APP reviews the urgent paper referral upon receipt with the attending on-call physician. A total of 231 charts were reviewed, of which 39 charts were excluded (i.e. chart was missing (n = 20); triaged by a physician (n = 2); or patient canceled or did not attend rheumatologic assessment (n = 17)). The charts that met inclusion criteria were subdivided into the corresponding priorities assigned by the APP during triage: priority 1 (P1); priority 2 (P2); and priority 3 (P3), and a weighted sample was generated. Ethics approval was obtained from both the urban academic center and the University of Toronto prior to data collection (REB # 2014-0096).

Triage system

Paper referral letters were received from physicians and promptly triaged by the APP into one of the three categories. These priority categories were set by the academic center but were guided by previous studies (Fitzgerald et al., 2011; Graydon and Thompson, 2008). The APP also provided a suspected diagnosis while triaging. The same APP triaged all referrals included in this study. Multiple rheumatologists then saw patients according to the benchmarked wait times, outlined by the CRA guidelines (Canadian Rheumatology Association, 2014), to the

designated prioritization, where a diagnosis was made. The priorities are as follows: Priority 1 (P1) – Patients who present with symptoms indicating IA. These patients are scheduled within 31 days of referral, to begin DMARDs as appropriate; Priority 2 (P2) – Patients who present with non-inflammatory arthritic symptoms. These patients are seen within 90 days of referral; and Priority 3 (P3) – Patients who present with symptoms of chronic pain. These patients are seen within 240 days of referral.

Study sample and data collection procedure

An online random number generator was used to select approximately 64 charts of each priority in order to obtain a sample size of 192 charts. The sample size was calculated based on parameters surrounding the prevalence-adjusted bias-adjusted kappa (PABAK) to ensure that our study had the stated probability of detecting a substantial PABAK, should it exist. To calculate sample size, a chart based on the goodness-of-fit formula was used with the following values (Sim and Wright, 2005): (1) two-tailed test; (2) null value of 0.4; (3) minimum PABAK of 0.6; (4) power of 80%; and (5) expected proportion of positive ratings (70%).

The randomization procedure was repeated four times to account for exclusions until the full sample size was obtained. The chart abstraction tool (Supplementary material) was developed by the APP in collaboration with the four rheumatologists at the urban academic center. The first 10 charts were reviewed by the same four researchers to ensure consistency in data collection. Furthermore, double data entry was conducted on an additional 10 charts as a quality control measure. Decision rules about common phrases in charts were made for consistency during abstraction. These rules included: (1) Diagnoses by rheumatologists that were diagnosed as "likely," "suspicion of," or "probable" were assumed to be conclusive; (2) Recent onset MSK or mechanical pain diagnoses were considered a P2 triage; (3) Any chronic pain or stenosis diagnosis was considered a P3 triage; and (4) Patients with controlled, previously diagnosed IA who were referred for chronic pain were considered a P3 triage.

The priority ranking assigned by the APP in paper triage was then compared to the outgoing diagnosis priority ranking. In the case of discordance, the information available to the APP was contrasted with the information available to the rheumatologist by four researchers (KB, CB, AL, and BM), who first considered the information individually and subsequently agreed on the reason for discordance through discussion. The variables considered are outlined in the chart abstraction tool (Supplementary material).

Analysis

Data from the Excel spreadsheet were imported into IBM SPSS Statistics 23 for data analysis. The rheumatology diagnosis for each patient was converted into its corresponding priority ranking for the purpose of comparison. The rheumatologist was considered the "gold standard" for comparison when analyzing the predictive validity of the APP's referral triage, and a percentage of concordance was determined. To augment these findings and eliminate the possibility of the results occurring by chance, a PABAK coefficient for ordinal scales was calculated. A PABAK greater than 0.6 was considered substantial (Viera and Garrett, 2005).

For the purposes of calculating sensitivity, specificity, and positive and negative predictive values, the 3 × 3 matrix in Table 1 was collapsed into a 2 × 2 matrix for each priority category. See Table 2 for an example separating the inflammatory diagnoses (P1) from non-inflammatory diagnoses (P2 and P3). The purpose of these groupings, shown in Table 2, was to distinguish the time-sensitive autoimmune diseases requiring prompt DMARD therapy (priority 1 diagnoses) from the joint conditions not requiring time-sensitive medication. Binomial proportion confidence intervals (CIs) were calculated using VassarStats. Finally, descriptive statistics were used to suggest potential reasons for discordance.

Results

Demographics

The average age of the patients was 54 years (standard deviation [SD] = 16) with 78% being female. The APP ranked more individuals as P1, but ranked less individuals as P2 and P3 compared to rheumatologists

Table 1. APP * rheumatologist prioritization cross-tabulation matrix.

		Rheumatologist priority ranking			
		1	2	3	Total
APP paper triage priority ranking	**1**	35	25	5	65
	2	2	56	7	65
	3	1	6	55	62
Total		38	87	67	192

Table 2. Collapsed 2 × 2 matrix separating inflammatory (priority 1) from non-inflammatory conditions (priority 2 and 3).

		Rheumatologist priority ranking		
		1	2/3	Total
APP paper triage priority ranking	**1**	35	30	65
	2/3	3	124	127
Total		38	154	192

(Table 1). Table 3 shows the distribution of suspected diagnoses based on paper triage and the actual diagnoses made by the rheumatologists for the sample population. Similar diagnoses were given by both paper triage and the outgoing diagnosis of the rheumatologists for over 25 different conditions. Mean number of days from referral to specialist consultation progressively increased with less urgent priority ranking. The average wait time for individuals with a referral suggestive of a P1 diagnosis was 36 days (SD = 34). For individuals suspected of having P2 or P3 diagnosis, the average wait time was 61 days (SD = 38) and 114 days (SD = 56), respectively (Figure 1).

Concordance, sensitivity, and specificity

The raw proportion of agreement between paper triage as performed by the APP and the rheumatologists was found to be 76% (Table 1). The PABAK was found to be 0.80; 95% CI [0.70, 0.90]. The concordance, sensitivity, specificity, positive predictive value, and negative predictive value are reported for each priority category in Table 4. Concordance was high for P1 (92%) and P3 (82%), but lower for P2 (64%). The APP triaged 25 of the 87 P2 cases as P1 (Table 1). Given the time-sensitive nature of diagnosing P1, it is noteworthy that of the 38 patients given a P1 diagnosis by the rheumatologist, the paper triage correctly identified 35 of them based on the information provided in the referral letter alone (Table 2). For the three discordant P1 cases, two cases had referrals that suggested diagnoses that were not consistent with the outgoing rheumatology diagnosis. The third case had imaging ordered by the rheumatologist which was unavailable at the time of triage by the APP. The sensitivity of the P1 diagnosis was calculated to be 0.92, 95% CI [0.78, 0.98], while the specificity was calculated to be 0.81, 95% CI [0.73, 0.86].

Table 3. Summary of APP-suspected diagnoses and rheumatologists' diagnoses for sample population.

	APP	Rheumatologist
Priority 1 diagnoses		
Psoriatic arthritis (PsA)	15	10
Undefined inflammatory arthritis (IA)	10	3
Undefined connective tissue disease (CTD)	7	1
Lupus (SLE)	4	2
Rheumatoid arthritis (RA)	4	5
Inflammatory bowel disease (IBD)-related arthritis	4	3
Sjogren's	4	2
Spondyloarthritis (ankylosing spondylitis, sacroiliitis)	3	2
Myositis	2	0
Polymyalgia rheumatica (PMR)	2	2
Other[a]	10	8
Priority 2 diagnoses		
Osteoarthritis (OA)	20	31
Mechanical back pain	18	12
Tendinopathy	9	14
Low back pain (LBP)	4	5
Gout	4	4
Osteoporosis (OP)	3	2
Bursitis	2	2
Degenerative disc disease (DDD)	2	1
Other[a]	3	17
Priority 3 diagnoses		
Fibromyalgia (FM)	39	28
Chronic pain	17	27
Generalized pain	4	1
Chronic fatigue	2	2
Myofascial pain syndrome	0	6
Other[a]	0	2
Total	**192**	**192**

[a]Other included diagnoses that occurred only once in the sample, such as Raynaud's, scleroderma, pruritus, and hyperparathyroidism.

Discordance

There were 46 total cases that were discordant due to incorrect priority rankings by paper triage (30 P1, 9 P2, and 7 P3). For each discordant case, the referral features available to the paper triage process were compared to the information available to the rheumatologist from the clinical examination, imaging, and laboratory results. Observed reasons for discordance included incomplete or incorrect information in the referral letter (n = 44) or additional investigations unavailable in the paper triage to determine the final diagnosis (n = 2). Eighteen of the discordant referrals relayed information that yielded a higher priority rating (specifically a past medical history of psoriasis or inflammatory bowel disease, laboratory testing, or imaging results suggestive of possible IA/CTD) but were ultimately not found to have IA/CTD following rheumatologic consult. None of the discordant cases deteriorated while waiting to be seen.

Additionally, trends were observed for both psoriatic arthritis (PsA) and OA. The paper triage identified 15 patients with a suspected diagnosis of PsA (P1) based on information contained in the referral letter. Ten of these 15 patients were confirmed as having PsA by the rheumatologist with the other 5 being diagnosed with a lower priority disease. Additionally, no patients with an outgoing rheumatology diagnosis of PsA were missed by the paper triage process. For the five patients who were incorrectly triaged as P1 due to suspected PsA, the referral letters included either a family history of psoriasis and joint pain (n = 4) or a statement from the physician suggesting a diagnosis of PsA with no additional information (n = 1).

Twenty-nine patients were given a diagnosis of OA by the rheumatologist, corresponding with a P2 prioritization. Eleven of these patients were incorrectly triaged by the paper triage process: seven were triaged as a P1 and four were triaged as a P3. In these patients' charts, it was observed that the rheumatologist had additional imaging for six patients and information

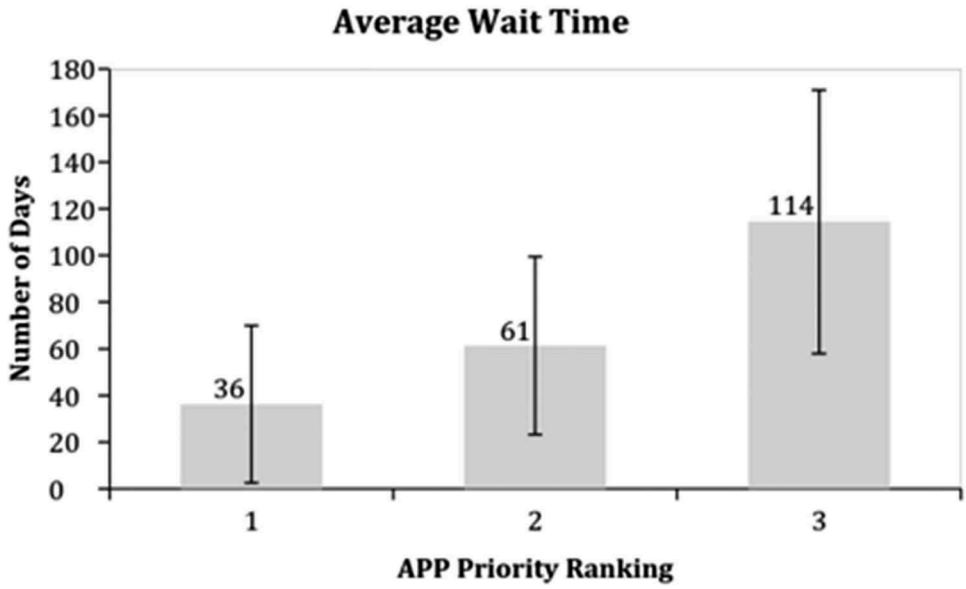

Figure 1. Average wait time by APP priority ranking. Error bars represent 1 standard deviation.

Table 4. Concordance, sensitivity, specificity, and positive and negative predictive values by priority diagnosis.

	P1	P2	P3
Concordance	92%	64%	82%
Sensitivity	0.92 [0.78, 0.98]	0.64 [0.53, 0.74]	0.82 [0.70, 0.90]
Specificity	0.81 [0.73, 0.86]	0.91 [0.84, 0.96]	0.94 [0.88, 0.98]
Positive predictive value	0.54 [0.46, 0.62]	0.86 [0.75, 0.93]	0.89 [0.78, 0.95]
Negative predictive value	0.98 [0.93, 0.99]	0.76 [0.67, 0.83]	0.91 [0.84, 0.95]

95% confidence intervals are reported in square brackets.

on bony tenderness for three patients. Therefore, the lack of information available on the referral appeared to impact the specificity of the paper triage process.

Three patients were given a P1 diagnosis by the rheumatologist, whereas the APP had given a P2 (two patients) or P3 (one patient) rating. In one case, the APP gave a P2 rating as the physician referral indicated osteoporosis; however, the rheumatology diagnosis following clinical assessment was RA. In the two other cases, a rheumatology diagnosis of sacroiliitis was given following imaging, while the APP had ranked one patient as P2 (MSK pain) based on the referral with no additional information, and the other patient as P3 (fibromyalgia (FM)) as the referral note indicated a history of FM.

Discussion

This study demonstrates a valid paper triage process as implemented by an APP within an outpatient rheumatology clinic. It builds upon previous work demonstrating improved access to care through triage (Farrer et al., 2016). The findings of substantial concordance, sensitivity, and specificity of the paper triage priority assignment support the role of physiotherapists in the triage process, enabling improved access to priority patients and optimizing health human resources.

New models of care with triage systems have been implemented to help identify and differentiate cases of IA from less emergent conditions in order to promote timely referral to rheumatologists for assessment, diagnosis, and treatment, thus facilitating access to care (Graydon and Thompson, 2008). Typically, in such triage systems, the rheumatologists triage the patients (Finckh, Liang, van Herckenrode, and de Pablo, 2006); however, the need to include other HCPs in this system has been recognized due to the increasingly high workload being placed on rheumatologists in Canada (Carpenter and Katz, 2014). Other studies reveal the use of "triage clinics" where patients are assessed by another physician or HCP before seeing the rheumatologist (Gamez-Nava, Gonzalez-Lopez, Davis, and Suarez-Almazor, 1998; Graydon and Thompson, 2008). However, this can add a barrier to the timely initiation of DMARD therapy as another physician appointment, clinical time, and compensation are required. The paper triage process evaluated in this study showed similar sensitivity and specificity to a

triage process involving a complete clinical exam (Gamez-Nava, Gonzalez-Lopez, Davis, and Suarez-Almazor, 1998), despite the paper triage having only referral information upon which to determine priority ranking. Hence, paper triage is valid while being less resource intensive than clinical examination. Lastly, a proposed alternative to "triage clinics" is standardized referral forms developed for referring physicians. A standardized referral form, the Comprehensive Arthritis Referral Tool (CART), was developed with a sensitivity of 91% for early detection of IA (Gran and Nordvåg, 2000). However, the author evaluating the form recognized that it requires adjustments to improve its use, as it may lack pertinent information (Gran and Nordvåg, 2000).

The triage process described here demonstrated a high sensitivity and specificity. With the implementation of a centralized paper triage system, a priority of this research was to evaluate the ability to correctly identify potential IA/CTD referrals (i.e. P1 diagnoses). Thus, a high sensitivity ensures that individuals with limited signs of IA/CTD are promptly evaluated to facilitate DMARD initiation and minimize joint damage and resultant disability. High specificity ensures that the hospital is not burdened with an unnecessary number of high prioritizations. Carpenter and Katz (2014) assessed a system where rheumatologists triaged paper referrals and found sensitivity to be 0.91. The paper triage process carried out by an APP in this study is comparable, with a sensitivity of 0.92 demonstrated for P1 diagnoses. This suggests that an APP with appropriate training may be able to triage as effectively as a rheumatologist, although this was not formally evaluated in this study.

This paper supports previous work indicating that paper referrals may lack relevant information, such as imaging and/or bloodwork, and therefore negatively impact wait times (Gran and Nordvåg, 2000); however, average wait times for the patients in this study reflect those outlined by the CRA for best practice guidelines (Canadian Rheumatology Association, 2014). Previous research regarding paper triage in rheumatology has identified similar concerns about the quality of information available on which to base triage decisions (Thompson et al., 2014). Studies evaluating the MSK assessment and treatment skills of primary care physicians have identified a perceived level of decreased competence (Matheny et al., 2000). Therefore, primary care physicians may feel less competent to effectively assess and arrange for appropriate investigations, thereby contributing to the decreased quality of referrals. The literature has shown that primary care physicians often make inappropriate referrals of non-inflammatory conditions (Lineker et al., 2000). Referral forms commonly lack key subjective and objective features suggestive of inflammatory conditions potentially suggesting that primary care physicians' understanding of rheumatic signs and symptoms is also in need of improvement (Matheny et al., 2000). Current studies have demonstrated success through education programs to improve the quality of referrals from primary care physicians (Graydon and Thompson, 2008) and may contribute to reduced wait times and increased validity of triage. Continued education for primary care physicians regarding the complex nature and common presentation of rheumatic conditions may help continue to improve the triage process. The requirement to include standard tests as part of a referral has been considered, but would need to be evaluated further to determine the effectiveness and inefficiencies derived from potentially unnecessary investigations. In fact, Choosing Wisely Canada has rheumatology recommendations for the use of laboratory and imaging investigation to limit unnecessary testing, erroneous diagnosis, and even inappropriate therapy (Canadian Rheumatology Association, 2017). Further research addressing the quality of referrals is recommended to enhance the paper triage process.

While the number of discordant cases by diagnosis was not large enough to draw conclusions to outline specific recommendations for appropriate referral information by disease, some trends were observed. The majority of discordant cases were individuals prioritized as a P1, when the outgoing diagnosis showed they were truly a P2 or P3. This likely represents cautiousness by the APP in identifying P1 referrals and is expected. Fifteen of the referrals indicated a patient with psoriasis and joint symptoms, with 10 of those referrals resulting in a confirmed diagnosis of PsA and 5 resulting in a diagnosis of OA. Eleven of the discordant charts had outgoing diagnoses of OA (a P2 diagnosis) but were triaged as a P1 diagnosis. Further research addressing the assessment of PsA and OA may facilitate the triage of these specific diagnoses.

This study has some limitations. First, a single APP trained through the ACPAC program was used as the triaging clinician. Hence, the results may not be generalizable to other APPs, especially those trained outside of the ACPAC program (Lundon, Shupak, Schneider, and Herold McIlroy, 2011). Practitioners trained in the ACPAC program have been shown to possess advanced assessment skills in comparison to experienced therapists, as well as competency and high patient satisfaction (Gormley et al., 2003). However, literature demonstrates the concordance between other HCPs and rheumatologists in triage systems, suggesting that formal training by a rheumatologist may be sufficient to produce similar results (Gran

and Nordvåg, 2000). Second, the results may not be generalizable to non-urban settings, due to greater deficits in HCPs such as rheumatologists and APPs in such settings. Third, the rheumatologists were not blinded to the APP's priority ranking, potentially leading to a biased diagnosis. However, it is likely that the breadth of information found through a full assessment outweighs the influence of the priority ranking on the final diagnosis. Fourth, detailed demographic data about the patients were not collected from the charts, but may have aided interpretation of the study findings. Fifth, it is difficult to draw causal conclusions regarding the discordant cases in this study due to the low frequency of data by disease collected for the discordant cases. Sixth, a retrospective study design was used, which has inherent limitations with respect to data quality and management. Finally, urgent referrals were excluded from this study as they typically bypass paper triage. This is a limitation in this study and presents a possible safety concern not fully evaluated in this study.

In conclusion, this study helps to support a triage system aimed at improving access to rheumatology services. Due to continuing restraints and a growing population of individuals requiring rheumatic care, this study supports the implementation of a standardized triage process, carried out by an APP, in the triaging of patients in a rheumatology setting. Use of a formally trained APP to systematically perform paper triage showed substantial concordance, sensitivity, and specificity. Applying this system could therefore be a valid way for facilities to meet wait-time benchmarks and improve access and delivery of health-care services.

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Declaration of Interest

C. Farrer serves as a consultant for Abbvie.

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