Harnessing the Electronic Medical Record to Improve the Evaluation of Soft Tissue Masses in the Primary Care Setting: Pilot Study on the Impact of a Best Practice Alert

Nicholas Reiners[1], Brandon Diessner[1], Robert Gao[1], Melissa Albersheim[1], Hughes A[1], Randolph Hurley[1]

[1]HealthPartners Cancer Care Center, Rein in Sarcoma, University of Minnesota, St. Paul, Minnesota, UNITED STATES

Introduction

Inappropriate evaluation of soft tissue masses (STM) leads to a delay in diagnosis of soft tissue sarcomas (STS) because these rare neoplasms are often mistaken for more common, benign conditions[2,3,4]. Prompt diagnosis followed by early involvement of sarcoma specialists reduces morbidity and mortality[7]. Clinical practice guidelines recommend magnetic resonance imaging (MRI) for STM greater than five centimeters in size or lesions that are enlarging, painful, or deep to the fascia[5,6]. Best Practice Alerts (BPA) have emerged as a form of artificial intelligence built into the electronic medical record (EMR) with a purpose of improving patient care and decreasing healthcare costs, yet they have been shown to be intrusive to busy primary care clinicians[1,8]. Currently there are no clinical decision-making support tools used to aid in the assessment and workup of a potential STS.

Objectives

- ✓ Retrospectively review STS cases in our HealthPartners (HP) system
- ✓ Develop an EMR BPA to prompt primary care clinicians to consider MRI evaluation of a STM based on specific criteria
- ✓ Assess primary care clinician acceptance of the BPA
- ✓ Measure the effect of the BPA on improving primary care clinician confidence in evaluating STMs
- ✓ Measure the impact of the BPA on patient care

Methods

- **Retrospective review**
  - Identified all STS diagnosed in the HP system from 2011-2016 excluding uterine, retroperitoneal, or other non-palpable presentations
  - Determined clinician demographics at initial presentation
  - Calculated delay in diagnosis defined as the number of days between initial presentation and date of diagnosis
  - Identified common ICD9-10 diagnosis codes used by clinicians to describe lesions at initial presentation
- **Implementation of BPA**
  - Developed BPA in EPIC EMR that offered a link to a "smart set" to expedite MRI evaluation of STM that were 1) greater than five centimeters or enlarging, 2) deep to the fascia, 3) painful, and/or 4) present without history of precipitating trauma
  - BPA was linked to previously identified ICD9-10 codes associated with STM
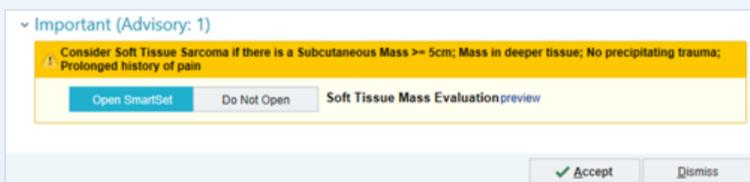 - BPA was utilized at five HP clinics for a period of three months

Figure 1A: view of BPA upon initial interaction.

- **Evaluation of BPA**
  - Primary care clinicians were surveyed prior to implementation of the BPA and at the end of a three-month period
  - Baseline evaluation assessed: 1) clinician type, 2) years in practice, 3) self-reported estimate of number of STS encountered during practice, and 4) confidence level in ability to recognize when to pursue STS workup
  - Post-implementation evaluation assessed: 1) change in confidence level in ability to pursue STS workup, and 2) acceptance of the BPA as a useful clinical decision-making support tool
  - 10-point Likert scales were used to assess changes in clinician confidence levels with STM evaluation before and after interacting with the BPA
  - Assessed impact on patient care through chart review to determine how many times a clinician interacted with the BPA, how many MRI scans were ordered as a result of the BPA, and the associated clinical outcomes

Results

- ❖ **Retrospective review**
  - ❖ 118 cases of STS were identified (33 presented as palpable masses)
  - ❖ Mean delay in diagnosis = 332 days [range 0-5969]
  - ❖ Most common clinician types were family medicine (45%) and internal medicine (24%)
  - ❖ 18 ICD9-10 codes were used to characterize lesions with most common being "lump" (782.2), "cyst" (706.2) and "swelling, mass or lump in head and neck" (784.2)
- ❖ **Implementation of BPA**
  - ❖ 64 primary care clinicians interacted with the BPA
  - ❖ Clinicians interacted with the BPA an average of 3.8 times per month (range 2.4-5.1)
- ❖ **Evaluation of BPA**
  - ❖ 41 clinicians (64%) completed a post-BPA survey and 24 clinicians (38%) completed both a pre- and post-BPA survey
  - ❖ The BPA significantly improved confidence levels when evaluating STM (table 2)
  - ❖ 75% of clinicians agreed or strongly agreed that the BPA enhanced their awareness of STS with 70% more likely to consider STS after viewing the BPA (table 3)
  - ❖ 17 MRIs were ordered as a result of the BPA (average per month = 1.9)
  - ❖ 3 malignant or potentially malignant diagnoses were identified (17.6%), while lipoma (n = 5) was the most common non-malignant diagnosis (29.4%)
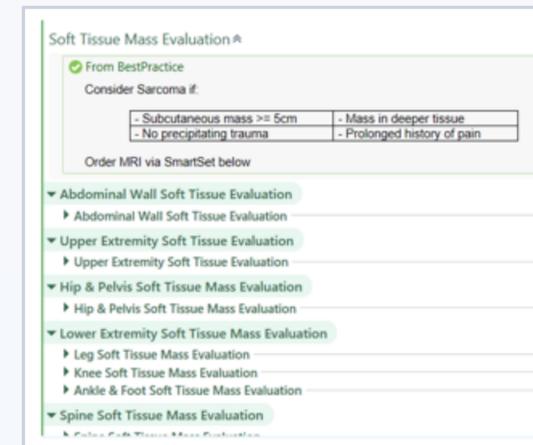

Figure 1B: view of "smartset" if BPA is accepted.

Figure 2. Participant's experience with the BPA

Table 1. Primary care demographics and experience diagnosing sarcomas*.

	Location	Number of participating clinicians	Years in practice [Median (range)]	Number of sarcomas diagnosed per clinician (Median (range))	Total reported sarcoma diagnoses
1	Arden Hills	12	4.25 (0.5 - 23)	0 (0 - 1)	3
2	Bloomington	8	12 (3 - 25)	0 (0 - 2)	4
3	St. Paul	14	18 (1 - 42)	1 (0 - 5)	23
4	White Bear Lake	11	5 (2 - 36)	0 (0 - 3)	8
5	Woodbury	19	9 (1 - 44)	1 (0 - 4)	21
	Overall	64	10 (0.5 - 44)	1 (0 - 5)	59

*data gathered was based on self-report of the clinician, defined as MD/DO/MBBS/PA/NP in family or internal medicine.

Table 2. Primary care clinician* confidence in their ability to recognize when to pursue a workup for a possible STS, pre- and post-BPA (1 = lowest confidence, 10 = highest confidence)

Confidence	Pre-BPA	Post-BPA	Change	p-value**
Median (range: lowest - highest)	4 (1 - 10)	6 (1 - 9)	2 (-1 - 6)	0.0001

*only participants who attended both pre and post BPA meetings were included (n = 24).
**p-value from Wilcox signed rank test.

Table 3. Primary care clinician acceptance of the BPA.

	n (% of total)				
	S. Agree	Agree	Neutral	Disagree	S. Disagree
I was interacting with the BPA too often.	2 (5)	5 (12)	15 (35)	11 (26)	10 (23)
The BPA enhances my awareness of soft tissue sarcoma signs and symptoms.	10 (24)	22 (52)	6 (14)	4 (10)	0 (0)
After viewing the BPA, I am more likely to consider a soft tissue sarcoma diagnosis.	10 (24)	20 (48)	6 (14)	6 (14)	0 (0)

Abbreviations: S. = Strongly.
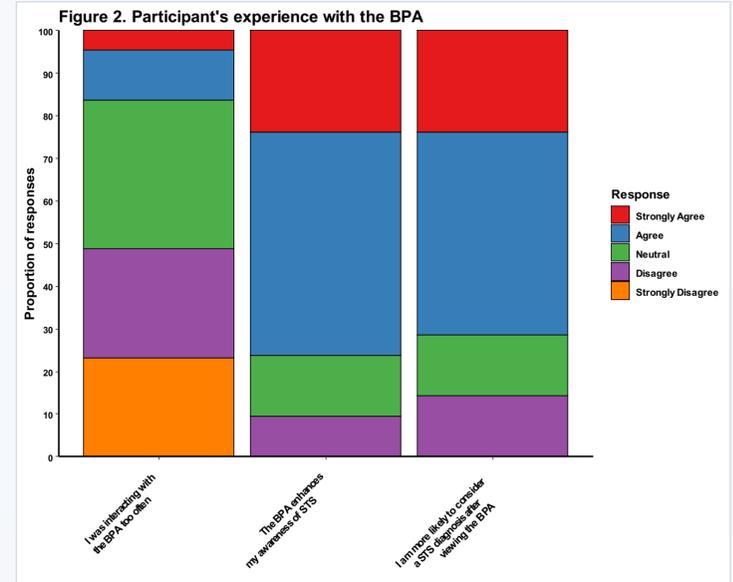
Conclusion

This pilot study linked a BPA to specific ICD9-10 codes associated with STM to prompt MRI evaluation for large or enlarging, deep, or painful masses. Seventeen MRIs were completed and three malignant or potentially malignant diagnoses were identified. Clinicians found the BPA to be a useful clinical decision-making support tool, and it improved their confidence levels when evaluating STMs. A larger healthcare system-wide project is planned.

References

1 Beasley JW, Wetterneck TB, Temte J, et al. Information chaos in primary care: Implications for physician performance and patient safety. J Am Board Fam Med. 2011;24(6):745-751.
2 Brouns F, Stas M, De Wever I. Delay in diagnosis of soft tissue sarcomas. Eur J Surg Oncol. 2003;29(5):440-445.
3 Clark MA, Thomas JM. Delay in referral to a specialist soft-tissue sarcoma unit. Eur J Surg Oncol. 2005;31(4):443-448.
4 Fossum CC, Breen WG, Sun PY, Retzlaff AA, Okuno SH. Assessment of Familiarity with work-up guidelines for bone and soft tissue sarcoma among primary care practitioners in Minnesota. Mayo Clin Proc Inn Qual Out. 2020;4(2):143-149.
5 Grimer RJ. Size matters for sarcomas!. Ann R Coll Surg Engl. 2006;88(6):519-524.
6 Nandra R, Forsberg J, Grimer R. If your lump is bigger than a golf ball and growing, think Sarcoma. Eur J Surg Oncol. 2015;41(10):1400-1405.
7 Nakamura T, Matsumine A, Matsubara T, Asanuma K, Uchida A, Sudo A. The symptom-to-diagnosis delay in soft tissue sarcoma influence the overall survival and the development of distant metastasis. J Surg Oncol. 2011;104(7): 771-775.
8 Zazove P, McKee M, Schleicher L, et al. To act or not to act: responses to electronic health record prompts by family medicine clinicians. J Am Med Inform Assoc. 2017;24(2):275-280..

Acknowledgements