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12-2020

The Creation Of An Algorithm To Assist Survivorship Clinics Identify The Rehabilitation Needs Of Cancer Survivors: An Administrative Case Report

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The Creation of an Algorithm to Assist Survivorship

Clinics Identify the Rehabilitation Needs of Cancer

Survivors: An Administrative Case Report

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14 The author has completed the HIPAA certification course and is compliant with university

15 requirements regarding the disclosure of PHI.

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17 Keywords: survivorship clinic, algorithm, cancer, screening, rehabilitation

18   **Abstract**

19   **Background and Purpose**: Approximately 40% of cancer survivors have unmet

20   rehabilitation needs. Cancer survivors not receiving rehabilitation care may be due to

21   survivorship clinics struggling to identify which of their survivors are appropriate for

22   rehabilitation. The purpose of this case report was to review the literature and create an

23   algorithm that could assist survivorship clinics with rehabilitation referrals.

24   **Case Description**: A survivorship clinic in Maine was attempting to address the lack of a

25   rehabilitation screening process. A survey done by the clinic showed that approximately 40%

26   of their survivors used rehabilitation services. To address this lack of a screening process, a

27   literature review was conducted in the summer of 2020 to identify common cancer

28   impairments that may necessitate rehabilitation services. From there, an algorithm was

29   created that contained screening measures to identify those impairments. The initial

30   algorithm consisted of the Pain Visual Analogue Scale, Fatigue Numerical Scale, and Short-

31   Form 36 health questionnaire.

32   **Outcomes**: The final algorithm consisted of two parts. First the oncologic clinician asks

33   themselves whether the survivor can exercise without medical supervision. The second is

34   associated with the scoring of the Short-Form 36. The results of these two parts determine

35   eligibility for referral to rehabilitation services. An expert in oncology rehabilitation vetted

36   the algorithm in the fall of 2020. Expert feedback resulted in the final algorithm creation.

37   **Discussion**: The stakeholders were unavailable to discuss an evaluation of the proposed

38   algorithm or implementation into the survivorship clinic due to the 2020 pandemic. With the

39   help of expert feedback, the final algorithm contributes to the growing body of literature

40   regarding screening for oncology rehabilitation referrals. Future research should be aimed at

41   the implementation of existing algorithms into clinics.

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43   Word Count: 3,390 words

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45   **Background and Purpose**

46   An estimated five percent of new cancer cases will occur in individuals aged 19-39, or

47   *adolescents and young adults* (AYA), in 2020.[1] It is estimated there will be 89,500 new

48   cancer cases in the year 2020, with the most common being thyroid, breast, melanoma, skin,

49   testes and others.[1] The five-year survival rate for AYAs in 1975 was approximately 70%, and

50   was estimated to be 84.6% in 2020.[1]

51   Physical impairments are the main reason why cancer survivors report poor physical

52   health. Weaver et al[2] asked 1,822 adult cancer survivors (no median age given but all were

53   over 18) to fill out the 10-item Patient-Reported Outcomes Measurement Information

54   System® (PROMIS®) Global Health Scale (PROMIS® Global 10) to assess their health-

55   related quality of life (HRQOL). The cancer categories were defined by site (i.e. breast,

56   prostate, etc.) by the researchers. Time since diagnosis and treatments received (if any) were

57   also reported.[2] Poor physical HRQOL was reported by 24.5% of survivors, whereas poor

58   mental HRQOL was reported by 10.1% of survivors.[2] Please refer to Table 1 for a non-

59   exhaustive list of common impairments seen in cancer survivors, and reasons they may be

60   referred to rehabilitation.[3]

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67   **Table 1.** Common Impairments and Reasons to Refer to Oncology Rehabiltation[3]

Impairment Category Domain	Reasons for Referral to Rehabilitation
General Physical	Difficulty returning to premorbid activities Fatigue Joint pain Musculoskeletal pain Neuropathic pain Referred Pain Weakness Deconditioning
Specific Physical	Autonomic dysfunction Back pain Balance dysfunction Bowel dysfunction Cervical range-of-motion limitations Chemotherapy-induced peripheral neuropathy Chest/thoracic pain Cognitive impairment Compression neuropathy
Functional	Difficulty with ADLs (dressing/bathing, etc) * Difficulty with IADLs (chores/shopping, etc) ** Prosthetics Assistive devices (cane, reacher, etc) Adaptive equipment needs Durable medical equipment needs Home safety evaluation Workplace evaluation Driving evaluation

68   **Table 1**. The left column describes the common impairment domains seen in survivors. The right
69   column lists various reasons in each domain a survivor may be referred to rehabilitation. *
70   ADLs: Activities of Daily Living, ** IADLs: Instrumental Activities of Daily Living.[3]
71

72   Cheville et al[4] examined 163 subjects with metastatic breast cancer (with a mean age of

73   56.2 years) and determined that 92% of the subjects had at least one physical impairment. Of

74   the 530 impairments identified by the researchers, 469 (88%) impairments necessitated

75   physical therapy (PT) and/or occupational therapy (OT) while only 21% received the rehab

76   services needed.[4]

77   When cancer survivors are not referred to rehab services, they may have impairment

78   needs that are never met. Thoreson et al[5] contacted cancer survivors and asked two questions

79   to ascertain the subjects' need for rehabilitation and whether rehabilitation services were

80   used. Of the 2,466 eligible individuals who were contacted, 1,325 questionaries were

81   returned (yielding a return rate of 54%).[5] The most common cancer diagnoses identified in

82   the respondents were as follows: breast, prostate, melanoma, non-Hodgkin lymphoma,

83   colorectal/anal, gynecological, and other.[5] Based on the responses, researchers determined

84   63% of respondents would benefit from rehabilitative services, with PT the most frequently

85   reported service needed at 43%. The researchers concluded 40% of the respondents reported

86   unmet needs.[5]

87   With an increase in cancer survivorship, some oncologists may look to rehabilitation

88   services (PT, OT, and speech-language pathology [SLP]) to screen for and treat cancer-

89   related physical impairments.[3] However, cancer survivors are not being referred to

90   rehabilitation services as often as they should be. This was demonstrated by the Thoreson et

91   al[5] study which found 40% of cancer survivors had unmet rehabilitation needs. This could be

92   due to a lack of understanding and clarity in the field of cancer rehabilitation.[3] Another

93   potential problem may be survivorship clinics struggling to select appropriate screening

94   assessments to identify impairments, as well as utilization of personnel who would assist

95   with referral to rehabilitation services.[3]

96   To address the problem of survivors not being appropriately referred, the goal of this

97   administrative case report was the creation of an algorithm that provided screening

98   assessments for the most common impairments seen in cancer survivors. The most common

99   impairments are discussed in detail in the Development of the Process section below. The

100   strategy to develop a successful outcome included: 1) a literature review to identify the most

101   common impairments, and 2) finding screening assessments that would help identify those

102   impairments. This case report is needed to improve the ability of survivorship clinics to

103   accurately and efficiently identify impairments that should be referred to rehabilitation

104   services. Stout et al[6] created a similar screening algorithm for cancer survivors that identifies

105   five domains (cardiometabolic, environmental, oncologic, aging, and behavioral) to inform

106   healthcare providers on exercise referrals for survivors. The researchers also take the

107   survivors' level of complexity into account when deciding exercise referrals. While the

108   algorithm proposed by Stout et al[6] was broader in its scope, the proposed algorithm for this

109   project focused solely on referrals to rehabilitation services.

110   The purpose of this case report was to review the literature to identify the most common

111   impairments seen in AYA cancer survivors and find the most appropriate and evidenced-

112   based screening measures for those impairments. From there, the next step was the creation

113   and implementation of an algorithm based on those screening measures to better assist a

114   survivorship clinic screen for impairments that necessitate referral to rehabilitation.

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116   **Case description: Target Situation and Setting**

117   The author had consent from all participating parties for this administrative case report.

118   The target setting was a suburban outpatient oncology center in the northeast region of the

119   United States with a survivorship clinic for cancer survivors. The outpatient center and its

120   employees were affiliates of a large urban hospital and its health network. No data discussing

121   the size of the survivorship clinic, or how many survivors they treat annually, was available.

122   The survivorship clinic was staffed by healthcare professionals including an oncologist,

123   survivorship navigator (Donna Green, Personal Communication, September 21st, 2020),

124   general physician, oncology nurse, and an oncology social worker. One of the main focus of

125   the healthcare providers was to screen for late effects of cancer treatment.[7] Late effects are

126   best described as side effects experienced by cancer survivors, usually after the completion of

127   cancer treatment.[7] Healthcare providers take a holistic approach and help survivors cope with

128   any issues they may have resulting from their cancer diagnosis, which could range from

129   difficulty at work to education about a healthy lifestyle.[8] While the oncology center treats

130   survivors at all ages, the main focus on this project was on the AYA survivorship clinic

131   program.

132   The main concern of the oncology center was they did not have adequate screening

133   services in place that would identify which of their patients may benefit from rehabilitation

134   services. The lack of a dedicated rehabilitation staff required the clinic to refer their patients

135   to a local, but separate, non-profit organization for integrative treatments such as massage or

136   acupuncture. The survivorship clinic had to refer their survivors to independent providers for

137   rehab services. Please reference Figure 1 for the services offered by the survivorship clinic

138   and the services for which they needed to refer to other locations.

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150   **Figure 1**. Services Offered by the Survivorship Clinic

Service	We Offer	Referral
Survivorship Care Plans	✓	
Survivorship Clinic	✓	
Mental Health Counseling (LCSW)	✓	
Psychiatric services	✓	
Social Work	✓	
Wellness programming		✓
Rehabilitation – PT, OT		✓
Speech-language therapy	✓	
Support Groups, Education		✓
Exercise		✓
Social work	✓	
Smoking cessation	✓	✓
Financial counseling	✓	✓
Sexuality counseling		
Family & Caregiver support		✓
Neurocognitive assessment	✓	
Nutrition	✓ *	
Spirituality		
Complementary Medicine	✓	✓
Specialty services – pulmonary, fertility	✓	✓
Cardio-oncology	✓	
Screening for recurrence	✓	✓
Screening for new cancers	✓	✓
Other		

151

152   **Figure 1.** The left column lists various healthcare services. The middle column lists the
153   services offered by the survivorship clinic. The right column lists the services that the
154   survivorship clinic has to make an outside referral for (Barbra Perry, Survivorship Clinic
155   Manager, Email Communication, July 21st, 2020).

156
157   Since the survivorship clinic did not have a screening process in place, some of their

158   patients may not have been referred to rehabilitative services appropriately. Figure 2 provides

159   the results of a survey regarding the services used by survivors at this clinic. The author is not

160   aware of these results being published in an article or journal. It was most likely performed

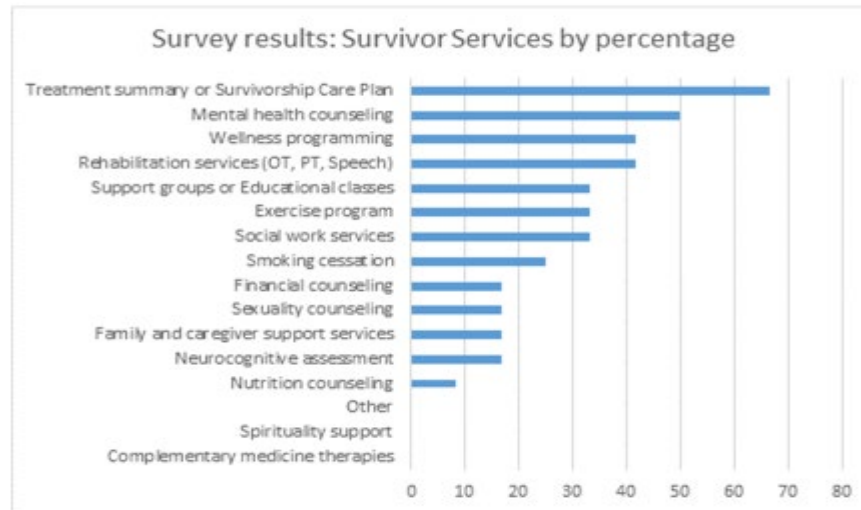161   internally by a clinic staff member to gauge the services survivors were using.

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166   **Figure 2.** Percentage of Services Used by Survivors

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168   **Figure 2.** On the left are the potential services available for a survivor at this survivorship
169   clinic. On the right is the percentage of survivors (sample size unavailable) who used the
170   service (Barbra Perry, Survivorship Clinic Manager, Email Communication, July 21st, 2020).
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172   Approximately 40% of survivors at this survivorship clinic used rehabilitation services.

173   Thoreson et al[5] surveyed cancer survivors who had one of the top ten most common cancer

174   diagnoses in Norway to ascertain rehabilitation needs. The researchers determined that 63%

175   of their cancer survivor subjects reported the need for at least one rehabilitation service.[5]

176   While one has to be cautious about comparing the results of one research study to this

177   specific survivorship clinic, it does illustrate the fact that this survivorship clinic may not

178   have been referring their patients to rehabilitation services at an appropriate rate.

179   The stakeholders reported there had been no previous management interventions to

180   ensure survivors are being referred to rehabilitation services when appropriately possible.

181   Regarding the stakeholder's perspective, the use of the algorithm would hopefully

182   increase the number of survivors referred to rehabilitative services. With more survivors

183   getting their rehabilitation needs met, they are more likely to stay active. The World Cancer

184   Research Fund (WCRF) states moderate physical activity leads to a decrease in new

185   diagnoses of colon, breast (postmenopausal), and endometrial cancers.[9] The WCRF also

186   states that physical inactivity may increase the risk of endometrium cancer.[9] A survivor does

187   not want to go through a new cancer diagnosis, and by addressing their rehab needs, we help

188   to ensure they can be physically active.

189   Addressing the lack of adequate screening would hopefully increase the percentage of

190   survivors who use rehab services, therefore, potentially improving their physical health and

191   wellbeing. Rehabilitation interventions have been shown to be effective in improving the

192   functional needs of cancer survivors, whether treatment is completed or ongoing.[10]

193   The lack of screening processes within the survivorship clinic was an appropriate case

194   report because it was able to be addressed through a literature review that resulted in the

195   creation of an algorithm. The goal was to improve the ability to get cancer survivors

196   appropriately referred to rehabilitation services. The algorithm would hopefully function as a

197   means for the survivorship clinic to make referrals for rehabilitation services without needing

198   an actual PT on site. The creation of the algorithm was done by reviewing current literature

199   regarding the most common cancer impairments, and recommended screening assessments

200   based on current evidence regarding oncology rehab. Thus, the clinic could be confident the

201   algorithm was user-friendly, evidenced-based, and up-to-date.

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203   **Development of the Process**

204   The algorithm required specificity to adequately capture all the survivors who needed

205   rehabilitative services. It also needed to be both time- and cost-efficient for it to be

206   implemented in the survivorship clinic. In order to achieve this, the development process

207   focused on reviewing the literature to identify the most commonly reported impairments seen

208   in survivors, as well as how to screen for those impairments with good clinical utility.

209   One of the most common impairments experienced by cancer survivors is pain. Van den

210   Beuken-van Everdingen et al[11] conducted a meta-analysis of 122 studies pertaining to cancer-

211   related pain. With a sample size of 63,533 survivors, roughly 66% reported pain with

212   metastatic or terminal cancer, while 39% reported pain after curative treatment and 55%

213   reported pain on anticancer treatment.[11] This study demonstrated the importance of an

214   algorithm to accurately measure pain and indicate a reason to refer to rehab.

215   Silver et al[3] lists fatigue as one of the general physical impairments that might be a reason

216   to refer to rehabilitation. Stasi et al[12] performed a critical appraisal of the literature regarding

217   the prevalence and epidemiology of cancer-related fatigue. The researchers reviewed

218   multiple epidemiological studies regarding cancer related fatigue. With a subject population

219   of over 700 heterogenous cancer survivors between the various studies, the researchers

220   concluded fatigue is present in about 50% of survivors at the time of diagnosis.[12] They also

221   found 80-96% of survivors on chemotherapy report fatigue and 60-93% report fatigue during

222   radiation therapy.[12] This study highlights the importance of having a measure to screen for

223   fatigue in the algorithm.

224   The addition of an outcome measure that was broader in its scope would allow the

225   algorithm to screen for a wider variety of survivors. While the (PROMIS®) Global Health

226   Scale was mentioned previously, the Short-Form 36 (SF-36) was chosen as it is a

227   recommended functional assessment tool for assessing health status.[3]

228   Please refer to Table 2 for a list of screening measures included in the algorithm.

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233 **Table 2**. Screening Measures Selected with Rationale for Inclusion and Scoring Instructions

Screening Measures	Rationale for Inclusion	Scoring Instructions
Pain Visual Analogue Scale (VAS)	• Highly recommended for cancer survivors with an EDGE task rating of 4/4 (*highly recommended*)[13] • Test-retest reliability of .80, and concurrent validity of .70 in the cancer population.[14]	• The respondents mark where along a 10-cm line they feel their pain intensity is best represented, with the end of the lines representing the extremes (*no pain* on the left, *extreme pain* on the right).[13] • A link to the digital version of the pain VAS can be found in Appendix 1.
Fatigue Numerical Scale (FNS)	• 10-point numeric rating scale for fatigue was the best screening assessment for cancer survivors and rated 4/4 by EDGE task force[15] • Sensitivity of 76.3% and a specificity of 87% in 157 advanced lung cancer survivors (median age 63.1 years)[16]	• The respondents use a ten-point scale typically starting with zero (*no fatigue*) to ten (*maximal fatigue*) to identify their fatigue level[16] • A link for an example of a 10-point numeric rating scale used for fatigue can be found in Appendix 1.

	• Convergent validity of .69 with the Cancer Fatigue Scale (CFS) and a test-retest reliability coefficient of .60 (p <.001).[16]	
Short-Form 36 (SF-36)	• Recommended functional assessment tool for assessing health status[3] • Researchers reviewed SF-36 data from 10,189 adult survivors of childhood cancer and concluded the SF-36 had good validity and reliability in adult survivors of childhood cancers.[17]	• Each question item is scored on a zero to 100 scale depending on the response, with zero typically meaning no problem or limitations and 100 meaning severe problem or complete limitation in the given domain.[18] • The eight domains are as follows: mental health; social functioning; physical functioning; energy and vitality; role limitation-physical; role limitation-emotional; bodily pain; and general health perception.[17] • A link to the digital version of the SF-36 can be found in Appendix 1.

234 **Table 2.** The left column lists the measures included in the algorithm. The middle column
235 describes the rationale for inclusion. The right column describes how each measure is scored
236 and provides a link to the measure in Appendix 1.
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238   The purpose of this case report was to create an algorithm that identified the most

239 common impairments seen in survivors and develop a way to systematically screen for them.

240   The process of the literature review helped identify three screening measures that address

241   many of the common impairments experienced by cancer survivors. The screener can quickly

242   use the pain VAS and FNS to identify pain and fatigue that might be a reason to refer the

243   survivor to rehabilitation services. The SF-36 is a more well-rounded questionnaire that

244   covers major health domains that the pain VAS and FNS would miss. The original plan was

245   to administer the SF-36 upon arrival at the survivorship clinic. Then, the screener could

246   administer the pain VAS and the FNS in the clinic. The idea was the collective information

247   from the three measures together could help guide clinicians on whether the survivor is a

248   good candidate for a referral to rehabilitative services.

249   The initial impression during the onset of this project was that falls were the most

250   common impairment experienced by cancer survivors. The literature review demonstrated

251   pain and cancer-related fatigue are two of the most common impairments experienced by

252   survivors. The ability to screen for those two impairments, as well as providing a screening

253   measure that is broader in its scope, will hopefully be comprehensive enough to become

254   implemented successfully in the survivorship clinic. Contacting individuals at other

255   survivorship clinics to discuss their own experiences, as well as asking them for advice

256   regarding this topic, benefited this project with the final algorithm creation.

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258   **Application of the Process**

259   As referenced in the Development of the Process section above, a literature review found

260   that pain and fatigue are common impairments seen in survivors. The importance of having

261   screening measures that can identify pain and fatigue was, thus, vital to include in the

262   algorithm. Please refer to Table 2 in the Development of the Process section above for a

263   summary of the interventions used in the algorithm, the rationale for inclusion, and scoring

264   instructions.

265   Each included measure had its own specific purpose. Please refer to Table 3 for a

266   summary of the purpose for each measure.

267

268   **Table 3**. Purpose for the Measures Included in the Algorithm

Pain VAS	Purpose: quick and effective way for providers at survivorship clinics to screen for pain that may determine necessity for rehab
Fatigue Numerical Scale	Purpose: quick and effective way for providers at survivorship clinics to screen for cancer-related fatigue that may determine necessity for rehab
Short-Form 36	Purpose: General health and quality of life questionnaire that asks questions across eight domains: mental health; social functioning; physical functioning; energy and vitality; role limitation-physical; role limitation-emotional; bodily pain; and general health perception (See Appendix 1).[17]

269   **Table 3.** The left column lists the screening measure included in the algorithm. The right
270   column describes the purpose for inclusion into the algorithm.
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272   In order to manage the lack of a proper screening protocol, a meeting was coordinated

273   between the stakeholders, the faculty mentor, and the author in the summer of 2020. The

274   literature review and formation of the algorithm took place in the summer and early fall of

275   2020. There was one email communication between the author and the stakeholders in July

276   2020, where the stakeholders informed the author that no previous management interventions

277   were attempted to address the screening issue. The author reached out to the stakeholders in

278   September 2020, to discuss their thoughts on the algorithm and its implementation into the

279   survivorship clinic. A meeting between Scott Capozza, MS, PT, the faculty mentor, and the

280   author occurred in October of 2020. Mr. Capozza, a board-certified oncologic specialist in

281   physical therapy at the Yale New Haven Health System's Smilow Cancer Hospital

282   Survivorship Clinic in Connecticut, and recognized as a national expert in oncology

283   rehabilitation, was gracious enough to offer feedback regarding the algorithm.

284   The algorithm has not yet been reviewed by the stakeholders or implemented in the

285   clinic. Mr. Capozza vetted the algorithm and stated that each of the three screening measures

286   in the algorithm would be appropriate for the project. However, Mr. Capozza stated that the

287   algorithm should be as brief as possible. After talking with Mr. Capozza and the faculty

288   mentor, the author decided to discard both the pain VAS and the FNS and only use the SF-

289   36. Since the SF-36 already has sections that ask the survivors about their pain and fatigue,

290   removing the pain VAS and FNS eliminates redundancy and decreases the time to administer

291   and score. The faculty mentor mentioned the Functional Assessment of Cancer Therapy-

292   General (FACT-G). The FACT-G is a quality of life outcome measure that is specifically

293   targeted to those with cancer (see Appendix 2). While the FACT-G could have been chosen

294   for the algorithm, the SF-36 was chosen as it went more in depth into limitation of activities,

295   which may be more beneficial for identifying the need for rehab services. The National

296   Comprehensive Cancer Network (NCCN) distress thermometer as a visual diagram for

297   survivors to rate their distress was recommended for consideration (see Appendix 2). The SF-

298   36 was chosen over the distress thermometer and problem list as it goes more into depth than

299   the NCCN problem list, which only allows yes or no responses. Mr. Capozza also mentioned

300   the algorithm from the American College of Sports Medicine (ACSM) roundtable and

301   Exercise is Medicine (EIM) initiative, which attempts to assist oncology clinicians on what

302   referral pathway is best for cancer survivors with regards to prescribing physical activity.[19]

303   Question three of the ACSM algorithm asks whether the oncologic professional believes it is

304   safe for their patient to exercise without medical supervision. If they answer *no*, the

305   algorithm states to refer out to a rehab specialist for follow-up.[19]

306   There are many factors that may impact the outcomes of the algorithm implementation.

307   The first factor is whether or not the stakeholders believe this algorithm will be useful in their

308   clinic. Another factor that may impact implementation is whether the providers using the

309   algorithm find it to be both time efficient and effective in identifying survivors for rehab

310   referral. If this goal was found to not be achieved after implementation, that could impact the

311   management interventions and necessitate a change to the algorithm.

312   The theoretical argument this administrative case report attempts to make is that one

313   measure can be sufficient enough to assist oncology professionals determine when to refer to

314   rehabilitation services. The SF-36 addresses pain, fatigue, and mobility limitation all in one

315   measure. The literature review has demonstrated that the SF-36 covers the more common

316   impairments seen in cancer survivors that can be remedied through rehabilitation.

317   Three changes were made to the algorithm. The first was the removal of the pain VAS

318   and the FNS. The SF-36 covers these domains and removing the other measures reduces

319   redundancy and streamlines the referral process. The second is the inclusion of question three

320   of the algorithm proposed by the ACSM.[19] This question allows the oncologic clinician to

321   decide whether they feel comfortable with their patient exercising without medical

322   supervision. The third change was the inclusion of cut-off scores in the SF-36 to determine

323   referral eligibility. Mr. Capozza mentioned than any survivor with moderate or higher scores

324   may be appropriate for rehab services. The reader should note the cut-off scores listed in the

325   Outcomes section are based on the expert opinion of Mr. Capozza, as well as the author's

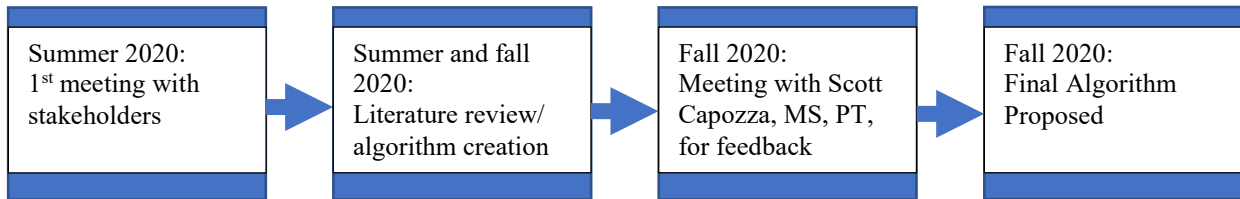326   interpretation of what a moderate score would be.

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328   **TIMELINE**

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Summer 2020: 1st meeting with stakeholders	→	Summer and fall 2020: Literature review/ algorithm creation	→	Fall 2020: Meeting with Scott Capozza, MS, PT, for feedback	→	Fall 2020: Final Algorithm Proposed

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334   **OUTCOMES**

335   The stakeholders were unavailable to discuss an evaluation of the proposed algorithm or

336   implementation into the survivorship clinic due to the 2020 pandemic. As a result, no

337   outcomes regarding the implementation of the algorithm into the clinic are available.

338   After meeting with Mr. Capozza and the faculty mentor, the final algorithm was

339   established and consisted of two steps. First, question three as proposed by the ACSM would

340   be asked.[19] Subsequently, the SF-36 would be scored to determine referral eligibility. Please

341   refer to Figure 3 for the final proposed algorithm.
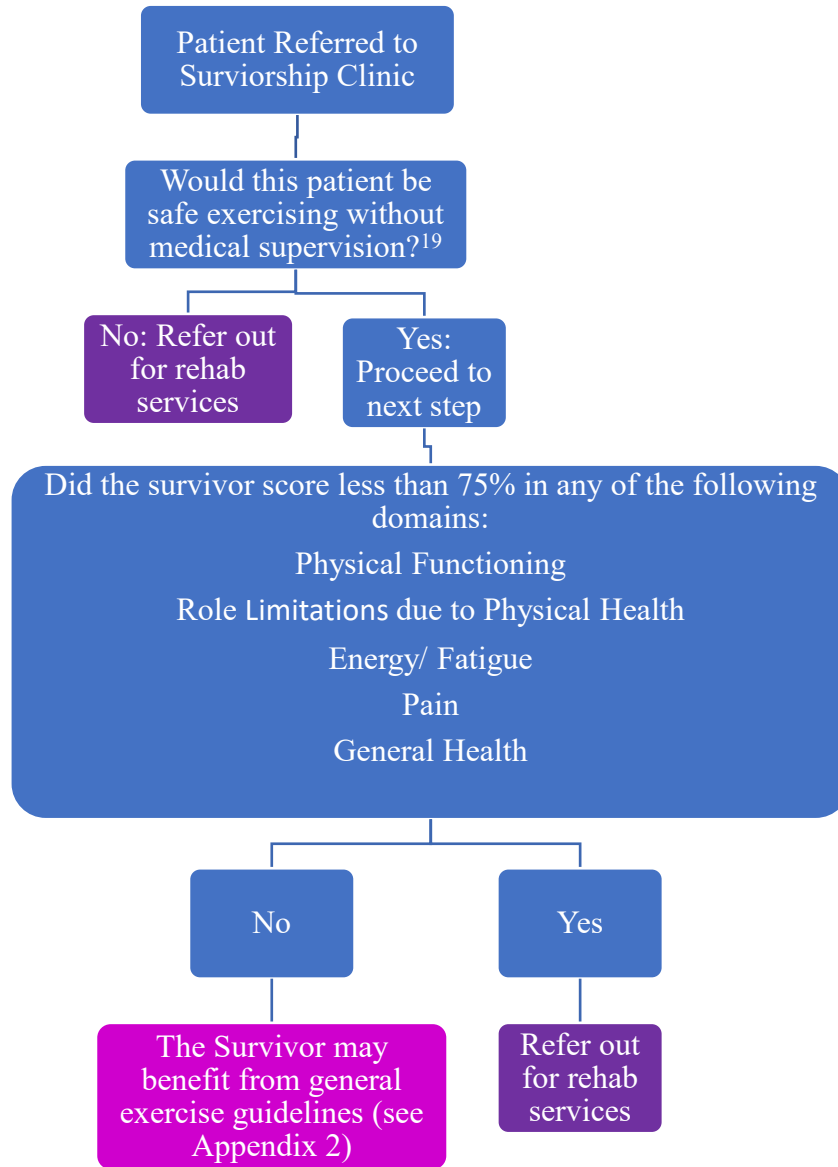
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351 **Figure 3.** The Final Proposed Algorithm


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        Patient Referred to
        Surviorship Clinic

        Would this patient be
        safe exercising without
        medical supervision?[19]

    No: Refer out        Yes:
    for rehab          Proceed to
    services           next step

    Did the survivor score less than 75% in any of the following
                          domains:
                    Physical Functioning
            Role Limitations due to Physical Health
                      Energy/ Fatigue
                            Pain
                      General Health

            No                        Yes

    The Survivor may              Refer out
    benefit from general          for rehab
    exercise guidelines (see      services
    Appendix 2)
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352

353   **Figure 3**. The algorithm consists of two steps. The first step is for the oncologic clinician to
354   ask themselves whether they feel this survivor can exercise without medical supervision.[19] If
355   they answer no, they should refer out for rehab services. If they answer yes, they should then
356   proceed to score the SF-36. If the survivor scores less than 75% in any of the domains listed
357   above, the clinician should refer out to rehab services. If the survivor scores 75% or higher in
358   all the domains listed above, the clinician should refer to Appendix 2 for general exercise
359   guidelines.
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365 **DISCUSSION**

366   Since the algorithm was not implemented into the survivorship clinic, this project was not

367   able to demonstrate the originally intended purpose. However, a meeting with one of the

368   nation's experts in oncologic rehab, Mr. Capozza, showed promise that one day it might

369   achieve that purpose. The literature review did, according to Mr. Capozza, provide common

370   impairments seen in cancer survivors and screening measures to identify those impairments.

371   Therefore, the literature review was successful in achieving its intended goal. The final

372   product was a refined algorithm that should be implemented into the clinic successfully if it

373   ever comes to fruition.

374   One of the strengths of this approach was that it was able to provide a succinct and clear

375   algorithm that the oncologic provider can use to determine eligibility for referral to

376   rehabilitation services. With the help of Mr. Capozza and the faculty mentor, the final end

377   product is efficient and practical. The main limitation of this approach was that it required

378   implementation in the clinic to determine success. Since it was not implemented into the

379   clinic, it is tough to discern the clinical utility of the algorithm at this time.

380   The goal of this project was to create an algorithm that was evidence-based, efficient and

381   comprehensive. The conclusion and main take-away for this project is that an algorithm used

382   to refer survivors to rehab services needs to be comprehensive, yet brief. Fulfilling these two

383   diametrically opposed requirements was one of the most challenging aspects of the algorithm

384   creation process.

385   If this algorithm is implemented within a survivorship clinic, the potential implications

386   could be profound. If the algorithm is found to be effective at screening survivors, it may

387   result in more survivors getting their rehabilitation needs addressed and potentially

388   improving their quality of life.

389   More research should be done to determine how to optimize the referral process. There

390   needs to be greater implementation of the already proposed algorithms, including the one

391   proposed here, and that proposed by Stout et al[6], into survivorship clinics. From there it can

392   be determined whether the measures are specific enough, or the cut off scores are accurate.

393   For example, if a rehab clinic gets overwhelmed with survivors, they might need to increase

394   the cut-off scores of the measures. Only through this trial and error can the algorithms be

395   developed, refined, and improved. If future research focuses on these aspects of screening,

396   cancer survivors will be well on their way to getting the rehabilitation care they need and

397   deserve.

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491   **TABLES and FIGURES**

492
493   **Table 1**. Common Impairments and Reasons to Refer to Rehabiltation[3]

Impairment Category Domain	Reasons for Referral to Rehabilitation
General Physical	Difficulty returning to premorbid activities Fatigue Joint pain Musculoskeletal pain Neuropathic pain Referred Pain Weakness Deconditioning
Specific Physical	Autonomic dysfunction Back pain Balance dysfunction Bowel dysfunction Cervical range-of-motion limitations Chemotherapy-induced peripheral neuropathy Chest/thoracic pain Cognitive impairment Compression neuropathy
Functional	Difficulty with ADLs (dressing/bathing, etc) ▪ Difficulty with IADLs (chores/shopping, etc) ▪ ▪ Prosthetics Assistive devices (cane, reacher, etc) Adaptive equipment needs Durable medical equipment needs Home safety evaluation Workplace evaluation Driving evaluation

494

495   **Table 1.** The left column describes the common impairment domains seen in survivors. The right
496   column lists various reasons in each domain a survivor may be referred to rehabilitation. ▪ ADLs:
497   Activities of Daily Living, ▪ ▪ IADLs: Instrumental Activities of Daily Living.[3]
498
499
500   **Table 2**. Screening Measures Selected with Rationale for Inclusion and Scoring Instructions

Screening Measures	Rationale for Inclusion	Scoring Instructions
Pain Visual Analogue Scale (VAS)	• Highly recommended for cancer survivors with an EDGE task rating of 4/4 (*highly recommended*)[13] • Test-retest reliability of .80, and concurrent validity of .70 in the cancer population.[14]	• The respondents mark where along a 10-cm line they feel their pain intensity is best represented, with the end of the lines representing the extremes (*no pain* on the left, *extreme pain* on the right).[13] • A link to the digital version of the pain VAS can be found in Appendix 1.
Fatigue Numerical Scale (FNS)	• 10-point numeric rating scale for fatigue was the best screening assessment for cancer survivors and rated 4/4 by EDGE task force[15] • Sensitivity of 76.3% and a specificity of 87% in 157 advanced lung cancer survivors (median age 63.1 years)[16] • Convergent validity of .69 with the Cancer Fatigue	• The respondents use a ten-point scale typically starting with zero (*no fatigue*) to ten (*maximal fatigue*) to identify their fatigue level[16] • A link for an example of a 10-point numeric rating scale used for fatigue can be found in Appendix 1.

	Scale (CFS) and a test-retest reliability coefficient of .60 (p <.001).[16]	
Short-Form 36 (SF-36)	• Recommended functional assessment tool for assessing health status[3] • Researchers reviewed SF-36 data from 10,189 adult survivors of childhood cancer and concluded the SF-36 had good validity and reliability in adult survivors of childhood cancers.[17]	• Each question item is scored on a zero to 100 scale depending on the response, with zero typically meaning no problem or limitations and 100 meaning severe problem or complete limitation in the given domain.[18] • The eight domains are as follows: mental health; social functioning; physical functioning; energy and vitality; role limitation-physical; role limitation-emotional; bodily pain; and general health perception.[17] • A link to the digital version of the SF-36 can be found in Appendix 1.

501 **Table 2.** The left column lists the measures included in the algorithm. The middle column
502 describes the rationale for inclusion. The right column describes how each measure is scored
503 and provides a link to the measure in Appendix 1.
504
505   **Table 3.** Purpose for the Measure Included in the Algorithm

Pain VAS	Purpose: quick and effective way for providers at survivorship clinics to screen for pain that may determine necessity for rehab

Fatigue Numerical Scale	Purpose: quick and effective way for providers at survivorship clinics to screen for cancer-related fatigue that may determine necessity for rehab
Short-Form 36	Purpose: General health and quality of life questionnaire that asks questions across eight domains: mental health; social functioning; physical functioning; energy and vitality; role limitation-physical; role limitation-emotional; bodily pain; and general health perception (See Appendix 1).[17]

506   **Table 3.** The left column lists the screening measure included in the algorithm. The right
507   column describes the purpose for inclusion into the algorithm.
508
509   **Figure 1.** A List of Services Offered by the Survivorship Clinic

Service	We Offer	Referral
Survivorship Care Plans	✓	
Survivorship Clinic	✓	
Mental Health Counseling (LCSW)	✓	
Psychiatric services	✓	
Social Work	✓	
Wellness programming		✓
Rehabilitation – PT, OT		✓
Speech-language therapy	✓	
Support Groups, Education		✓
Exercise		✓
Social work	✓	
Smoking cessation	✓	✓
Financial counseling	✓	✓
Sexuality counseling		
Family & Caregiver support		✓
Neurocognitive assessment	✓	
Nutrition	✓ *	
Spirituality		
Complementary Medicine	✓	✓
Specialty services – pulmonary, fertility	✓	✓
Cardio-oncology	✓	
Screening for recurrence	✓	✓
Screening for new cancers	✓	✓
Other		

510

511   **Figure 1.** The left column lists the services offered by the survivorship clinic. The right
512   column lists the services that the survivorship clinic has to make an outside referral for
513   (Barbra Perry, Survivorship Clinic Manager, Email Communication, July 21st, 2020).

514
515 **Figure 2.** Percentage of Services Used by Survivors

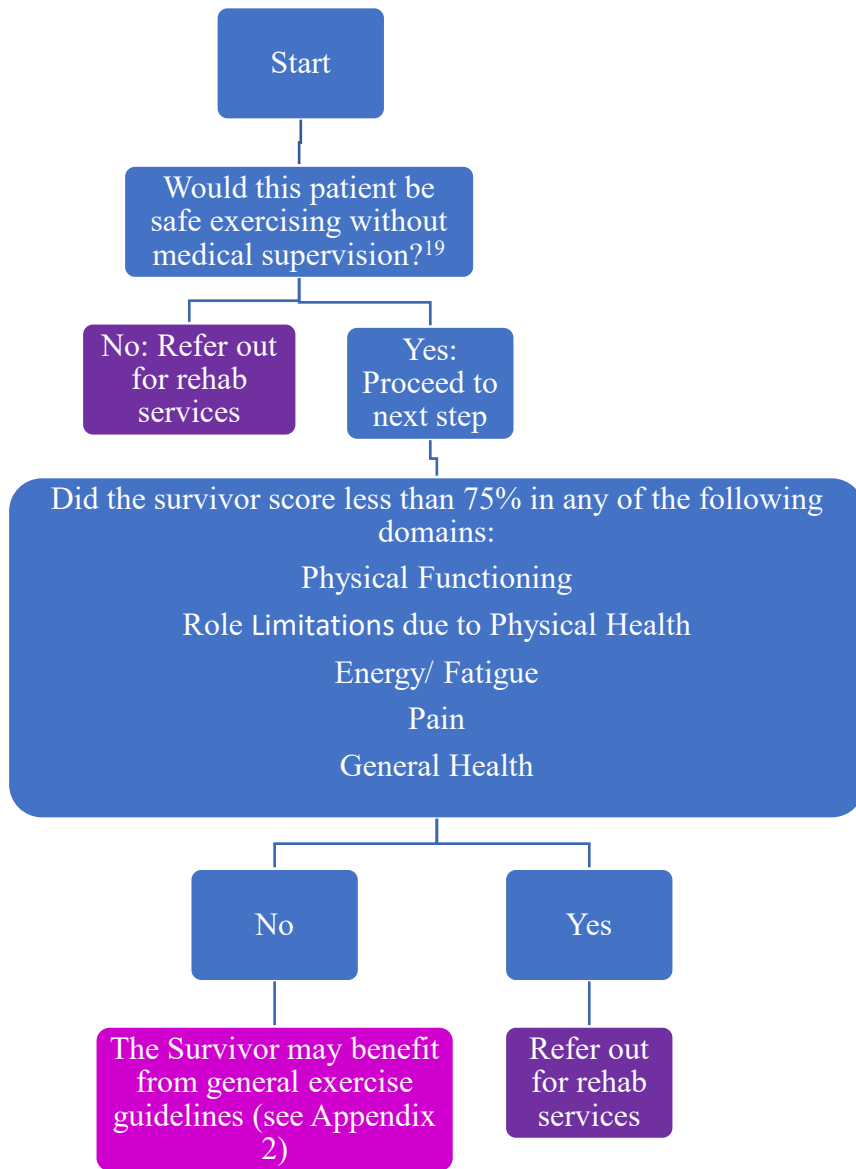Survey results: Survivor Services by percentage
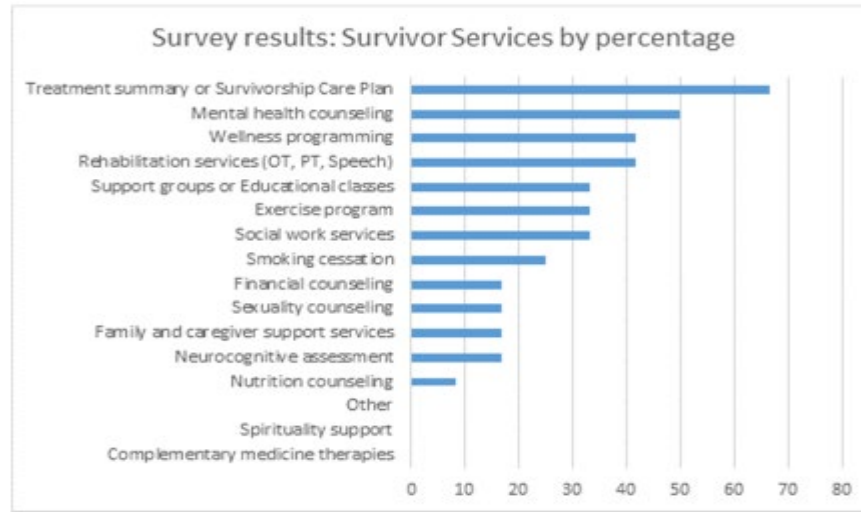
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517 **Figure 2.** On the left are the potential services available for a survivor at this survivorship
518 clinic. On the right is the percentage of survivors (sample size unavailable) who used the
519 service (Barbra Perry, Survivorship Clinic Manager, Email Communication, July 21st, 2020).
520
521 **Figure 3.** The Final Proposed Algorithm

522

Figure 3. The algorithm consists of two steps. The first step is for the oncologic clinician to ask themselves whether they feel this survivor can exercise without medical supervision.[19] If they answer no, they should refer out for rehab services. If they answer yes, they should then proceed to score the SF-36. If the survivor scores less than 75% in any of the domains listed above, the clinician should refer out to rehab services. If the survivor scores 75% or higher in all the domains listed above, the clinician should refer to Appendix 2 for general exercise guidelines.

536   **APPENDICES**

537   Appendix 1:

538   Visual Analogue Scale for pain:

539   https://www.physiotherapyalberta.ca/files/pain_scale_visual_and_numerical.pdf

540   Visual Analogue Fatigue Scale (below Fatigue Severity Scale):

541   https://www.sralab.org/sites/default/files/2017-06/sleep-Fatigue-Severity-Scale.pdf

542   SF-36 questionnaire:

543   https://www.orthotoolkit.com/sf-36/

544   Appendix 2:

545   FACT-G:

546   https://8beeac51-650b-405c-97a4

547   0987e05a41f1.filesusr.com/ugd/626819_acb819ba51fd4552807feef38250db3f.pdf

548   National Comprehensive Cancer Network (NCCN) Distress thermometer

549   https://www.nccn.org/patients/resources/life_with_cancer/pdf/nccn_distress_thermometer.pd

550   f

551   General Exercise Guidelines for Cancer Survivors:

552   https://journals.lww.com/acsm-

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560   **Modified Administrative CARE Checklist**

561

CARE Content Area	Page
1. **Title** – The area of focus and "case report" should appear in the title	Pg. 1562
2. **Key Words** – Two to five key words that identify topics in this case report	Pg. 1563

3. **Abstract** – (structure or unstructured)
     a. Introduction – What is unique and why is it important?
     b. The main concerns and important findings.
     c. The main management problem, interventions, and outcomes.
     d. Conclusion—What are one or more "take-away" lessons?
	Pg. 2564
	
	565

4. **Introduction** – Briefly summarize why this case is unique with literature references.	Pg. 3-6

5. **Setting Information**
     a. De-identified people and institution.
     b. Main concerns and management problem.
     c. History of the situation.
     d. Relevant past management interventions and their outcomes.
	Pg. 6-10

6. **Findings** – Relevant examination and description of the management problem	Pg. 6-10
7. **Timeline** – Relevant data about assessment and management intervention organized as a timeline (figure or table).	Pg. 18

8. **Assessment**
     a. Outcome measurement tools utilized to assess the problem and outcomes
     b. Challenges related to assessing the problem.
     c. Prognostic indicators of the success of the management intervention.
	Pg. 10-14

9. **Management Intervention**
     a. Types of intervention provided / implemented (pharmacologic, surgical, preventive).
     b. How management interventions were provided.
     c. Changes in the interventions with explanations.
	Pg. 14-18

10. **Follow-up and Outcomes**
     a. Management assessment of outcomes when appropriate.
     b. Important follow-up actions / plans.
     c. Intervention adherence and tolerability in the future.
     d. Adverse and unanticipated events.
	Pg. 18-19

11. **Discussion**
     a. Strengths and limitations in your approach to this case.
     b. Discussion of the relevant literature.
     c. The rationale for your conclusions.
     d. The primary "take-away" lessons from this case report.
	Pg. 20-21

12. **Stakeholder Perspective** – The manager can share their perspective on their case.	Pg. 9-10
13. **Consent** – The manager should give informed consent.	Pg. 6