出國報告 (出國類別: 進修)

癌症症狀處置暨復健、個案管理制度與運作

服務機關: 臺中榮民總醫院 護理部

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摘要 (含關鍵字)

「病人自評式結果」(patient-reported outcome, PRO)是以病人為中心，由病人自評症狀強度反應對各類治療、決策、存活率、醫療資源使用與生活品質的結果。從紙本式症狀評估掃描、平板式自評症狀評估功能連結醫院醫療系統三方面，擷取癌症病人背景資料、癌症診斷與治療，合併癌症病人自評 12 項 ESAS 症狀及強度的大數據資料中，學習 SAS 程式撰寫資料清除與結果分析的程式語法，建立永久性資料的延伸，從病人自評症狀強度的結果發現病人問題，比對數據與見習的真實性，提出臨床照護路徑(clinical care pathway)的發展與建議。發現研究部門是組織營運的重要核心，有如人體的心臟，不停地跳動，組織才能永續生存與發展，健康結果與行為則是影響治療效果、決策、存活率、醫療資源使用與生活品質的指標。未來，本院亦能持續發展與推動相同的臨床照護路徑建議，建立跨國性醫療照護合作橋梁，接軌國際照護品質與水準，更可作為個案管理制度與臨床照護方向的基石，發揮本院在癌症醫療照護的用心與特色。

關鍵字: 病人自評式結果、臨床照護路徑

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一、目的

癌症研究與症狀照護一直是全球注目的健康議題，期望持續提升存活率或減少失能，回到正常的生活軌道與品質。在疾病治療方面，不斷地推陳出新的藥物、儀器與手術方式，但是護理師們在第一線臨床照護中，除了要了解這些治療方式帶給病人的好處與傷害，更需要陪伴病人完成所有的治療療程。因此，本次出國進修目的，期與護理部平衡計分卡結合，精進腫瘤照護研究、實證教學與臨床應用：

1. **追蹤全程癌症照護過程，推動部科特色：**從疾病診斷、治療、復發至疾病末期，輔導癌症個案師應用「行動照護家 App」，追蹤癌症個案照護進度，平行推展 App 架構至其他疾病個案管理範疇。
2. **規劃進階腫瘤護理實務教育，培育腫瘤照護人才：**運用實證照護措施，發揮癌症照護特色，規劃及培育優秀護理人才訓練課程。
3. **撰寫國家型實證照護研究計畫，爭取院外研究經費：**從臨床追蹤及實務教育訓練，以實證研究步驟執行研究計畫書撰寫，獲得國家經費補助，得以學以致用，增加期刊及優質論文(SCI)發表。

二、學習過程

從申請與搜尋進修醫院，的確和進修回國的醫師心有同感。從申請經費補助到公文確認核定，就花去半年的時間，儘早進行機構/學校搜尋與自薦或請認識對方的老師/同儕協助引薦或轉介，多方面嘗試，並促進雙方交流。同時，準備及學習語言也是一種挑戰，因為是短期進修/參訪，對語言程度的要求，可能沒有像申請學位的規範，那麼嚴格!但是，聽力還是很重要!因為它是雙方溝通、在地生活及精進學習的重要工具。感謝許惠恒院長及張家慧主任支持，張美玉及施素真兩位副主任鼓勵及督導長們承接業務，還有我的老師-台大護理系賴裕和教授

及李芸湘助理教授協助，聯繫美國 NIH-NCI 長官(Paul Jacobsen)，轉介到美國佛羅里達州坦帕市墨菲特癌症中心。最後，由先生陪伴從出國、美國報到及回國，穩定住宿及交通問題，認識導師 Dr. Jim, Heather，她是心理學博士，研究領域橫跨實驗室檢測及行為科學，此次向她學習從臨床評估數據到臨床路徑建置的發展與可行性。

此次進修單位主要在院方核心發展的研究部門，除了無法實際參訪個案管理師的業務與角色，與出國預期目的略微出入，但是從閱讀文獻、查詢院內/外網路訊息、分析數據及參與會議中，發現更多認識醫院內部規劃與國際上癌症醫療照護的進展。在 6 個月的學習期間，獲得充實且滿滿的經驗，克服語言的聽、說、讀、寫的障礙及生活的不便性。感謝導師在第一個月的討論，同意我錄音及她又用寫的方式記錄討論重點，她的研究團隊鼓勵我說英文，他們會教我正確發音、字詞及用法，也用 Google 翻譯，進行溝通，也教我在美國生活的方法。在例行的研究小組會議中，完成兩次英語口頭報告，一次是自我介紹(附錄一)，介紹台灣與當地的地理位置、醫院及學校；一次是資料庫資料清除的經驗分享(附錄二)，後者的經驗分享讓大家肯定我在研究方面的資料處理能力與毅力，大幅進步英語演講的勇氣，期許未來能每年發表一次英語演講。一位博士後研究員指導英文論文寫作與技巧，獲得 SCI 期刊刊登的通知(附錄三)，另一位博士後研究員指導 SAS 統計語法(附錄四)。經由院內 PRIO 會議的參與及見習經驗，完成病人衛教的網頁路徑，主動製作 ppt 檔案，經與導師討論後，送出的資料獲得該組肯定，院方也同意採納建議後，進行程式修正。感謝導師與研究夥伴為我舉辦離別餐會，在最後一次的小組會議，鼓勵我繼續加油，頒發完訓證書(附錄五)。在離開機構前，也和導師的研究成員討論我的博士論文在統計分析與結果呈現的寫作方向，回國後盡速完成論文寫作及投稿。主要進度如下：

1. 進修機構

墨菲特癌症中心(Moffitt Cancer Center) (圖一)於 1986 年開幕，地點在美國佛羅里達州坦帕市南佛羅里達大學(University of South Florida, USF)校園內一角，還有 5 個分部在學校附近及機場，是全美 50 家癌症中心排名第八位，也是全佛州唯一美國國家癌症研究所(National Cancer Institute, NCI)認可為全面性的癌症中心(Comprehensive Cancer Center)(圖二)，擁有癌症

治療中最大的多科醫療照護團隊 (multidisciplinary medical team)及執行相當多的癌症臨床試驗研究。2018 年 11 月佛州癌症病人已達 130,000 人，僅次於加州，該機構 2015-2016 年統計新診斷病人數約 19,000 名，每日門診服務人次量約 20,000 名。醫療特色在胸腔外科及大腸外科癌症手術，護理部在「住院病人服務」也獲得 2012 年磁力醫院評鑑的肯定(圖三)。這裡的氣候穩定，很像台中，空氣大致良好，適合老人居住及疾病醫療。最近，除了 Moffitt 在擴建兩棟新大樓外，附近的南佛羅里達大學附設醫院新建手術大樓及一家榮民醫院也在擴建新大樓，周邊還有兩家復健中心。詢問同仁後，主要是因應老化人口增加，也促進美國人民到此居住意願，成為佛州居民，當州政府稅收充裕後，可以做更多的公共建設。

2. 進修單位

此次進修單位是健康結果與行為部門 (Department of Health Outcomes and Behavior)，屬於支持性照護醫療部門 (Department of Supportive Care Medicine)之一，研究健康相關行為、心理變化及生活品質等議題，以心理學及生統研究專家為主要的核心成員，也有 3 位護理博士。學習進度內容:

(1) 第一天:

i. 早上由醫院負責聯繫的人員帶領，製作進修人員名牌後，進行環境介紹，了解醫院特色，尤其在藝術治療方面，帶領病人利用畫作，融合治療經驗(圖四)，教導病人專注在創作方面，紓解治療的壓力，走廊牆面的畫作幾乎都是該院病人的作品，也鼓舞其他病人順利渡過治療黑暗期(圖五)。下午由進修部門秘書及輔導員帶領，認識進修部門的同仁及簡單自我介紹，與導師會談後，提供我在 8 月的學習計畫表，了解研究計畫相關會議、研討會的期程。

ii. 與導師會談: 目前五個已通過及執行中的計畫: “婦科癌症病人手術前生病行為相關因素”、“婦科癌症病人化學治療期間生活品質追蹤”、“口腔癌病人生活品質追蹤”、“低劑量電腦斷層檢查對肺癌診斷之機器學習與生活行為追蹤”、“血液腫瘤病人接受 CAR-T 臨床試驗治療後症狀追蹤與生活品質探討”。近期與放射腫瘤醫師討論及發展症狀評估量表平板設計在放射線治療病人的應用，期能開發臨床路徑模式。

另外，希望我能盡速完成 CITI 訓練，以利參加研究計畫的進行與討論。

(2) 第一週:

i. 用兩個半天，約 8 小時，完成 IRB CITI 訓練及認證(圖六)。

ii. 討論”婦科癌症病人手術前生病行為相關因素”、”婦科癌症病人化學治療期間生活品質追蹤”計畫書之閱讀心得 (包括:內容、格式)，發現癌症病人的生病行為對癌症治療的影響是一個重要議題，如:疲憊、憂鬱、疼痛等，一連串與細胞激素及動力學的關係。導師運用問卷了解病人的生病行為，也用實驗室設備得到的血液檢測結果，相互驗證身體與心理的機轉與關係，這些都是未來可以研究或發展實證措施的點子來源。另外，院方的臨床路徑發展還在起始階段，剛好我們醫院也在計畫這方面的方展，我提出一起學習及發展臨床路徑的步驟，這樣可以有跨國發展臨床路徑的計畫，她同意此想法及觀點。

iii. 每週學習進度討論、參與研究小組進度會議、每月一次大型會議(Grand round)。

(3) 第一~二個月:

導師協助我認識每一個部門及負責人，有放射腫瘤科醫師的觀點、專科護理師的角度，了解研究計畫相關部門人員對臨床路徑發展的期望，提供美國臨床腫瘤醫學會(American Society of Clinical Oncoligy, ASCO)建議腫瘤臨床路徑方案的評值標準(Evaluating Oncology Clinical Pathways Programs) (附錄六)及 Edmonton Symptom Assessment System (ESAS) 12 項症狀評估項目(附錄七)，選定研究計畫預計發展的方向，並開始收集及閱讀文獻。目前該院在發展臨床路徑前期，看了很多 National Comprehensive Cancer Network (NCCN)及 Oncology Nursing Society (ONS)的建議指引，尤其是 NCCN 的資料太繁瑣，不好唸，而且跳上、跳下、跳其他檔案，難怪在美國只有發展疾病診斷及治療的指引，在照護層面的指引並不清楚，需要再精進，連這裡的醫師都少用。NCCN 指引的 PDF 檔案，因為鎖碼，必須閱讀後，立刻一個字、一個字敲打鍵盤與紀錄，否則下次再看時，又遺忘了。為了加速學習的速度，我個人只好自行購買了 XMind 軟體，利用心智圖的概念(附錄八)，分析流程中的每一個步驟提出的內容，適合哪一類專業人員提供協助，將來要發展智能評估程式時，即能迅速提供閱讀後資料，

商請資訊工程師協助建置。導師又提供了加拿大安大略的癌症照護網站 (Cancer Care Ontario, CCO; https://www.cancercareontario.ca/en) (圖七)，經閱讀後，發現加拿大早已在癌症照護結合醫師及護理學會、醫院等資源建置此網站，提供 ESAS 評估工具及建議處置的完整訊息與經驗，醫師、護理師、其他醫療專業同仁及病人家屬均能以此評估結果，進行溝通與治療決策，病人衛教內容也涵蓋多國語言。

ESAS 評估工具涵蓋病人身體、心理、靈性及生活品質的評估項目，共 12 題及 1 題空白，應用性佳，能縮能伸，以單項症狀了解治療效果，也可以併用多項症狀，了解不同癌別病人的症狀群(symptom clusters)。ESAS 優點是各題項目一致標準，以 0-10 方法，標示病人當時的症狀感受；缺點是僅有 12 項症狀，「其他」空白症狀需以「自行輸入」症狀及評分，必要時需另外分析，如放射線治療導致皮膚癢的問題。反觀本院，除了一般性入院評估，在癌症照護評估工具有三項:疼痛、情緒壓力及化療副作用，第一項是 0-10；第二項是 1-5，分數加總，超過 10 分，直接會診諮商心理師；第三項是有/無，三者的評估標準及結果不一致。行動照護家 App 建置在個管師系統的評估項目是依 CTCAE 內容及評分方法，要綜合及應用這些結果來反映病人問題，實有難度。出國前，曾參訪和信治癌中心，提出門診、住院
及急診的病人評估一條龍，顯示醫療作業系統建置一套醫、護、病一致且能跨門、急、住的評估項目，提出共同的照護目標，也是發展癌症照護路徑必要的工作，而 ESAS 是最簡單、快速且可行的評估工具。

(5) 第三~四個月:

導師認為既然要學研究，一定要學會用 SAS 語法，提供約 24,000 筆的 ESAS 臨床評估數據及兩本 SAS 語法書籍(圖八)。雖然過去曾學過 SAS 語法，但因程式取得不易，無法再精進，為了儘速和相關研究人員合作及溝通，由 SAS 語法書籍自學，參考網路提供的語法技巧，也感謝本院生統小組徐倩儀小姐的網路講義，對生手學習初階 SAS 語法的幫助很大，再用 Excel 分析及 SAS 語法比對結果，和導師討論疑問後，再檢視原來的資料，發現許多錯誤及重複的資料。顯示大數據研究是各行各業發展的方向，運用 AI 技術、機器學習等方法演算後所得結果來預測可能發生/避免的期望值，如果在第一

時間收集的資料是正確的，所得結果的預測力及精準度高；反之，如果第一時間的資料不完全正確，那麼就必須花費許多人力及時間反覆校對及清除資料。因此，SAS 統計語法是初步建立資料一致性的方法，正確的程式語法幫助任何人在延續這類任務時，都可以快速上手。

藉由此次統計訓練，發現醫院都面臨同樣的問題，有長期來自各種不同樣貌的病人資料，這些數據需要被萃取、整理，分析及提出建議! 但是，最重要的步驟是數據要正確，必須要有耐心檢視不一致的地方。資料初篩可以先用 excel 檢視，並用 SAS 語法存檔，SAS 程式比 excel 及 SPSS 的優點是可以建立及儲存固定的流程，以利日後研究同仁想要繼續分析及發展，可以用同樣的方法除錯。另外，個人型研究屬於小樣本研究，要找統計 p 值(p< .05)的臨床意義很辛苦；臨床數據屬於大樣本研究，p 值到處都在，又混淆了數據的真實性。找對真正能反映結果的統計方法，真的不容易!

感謝導師提供個人在學習 SAS 語法寫作的經驗分享，也讓她的助理及學生認同每一個工作角色在研究中的重要性與價值。在 SAS 語法練習，進一步學習巨集(Macro)語法，這部分就有一點難了!多了很多符號，邏輯不是很容易懂!只能先向博士後研究員學習。但是，我以 Excel 資料表匯出及列印後學習，發現把原來完整的數據，從縱貫性資料變成橫斷性資料(最高的症狀負荷分數及大於 7 分的症狀數目)，在資料的解讀又不一樣了，大數據的面向真是多樣化。期許自己能快速學到重點，才能有效運用我們的數據，找出優勢與弱點，強化研究能力與溝通技巧。

(6) 參與三次病人報告資訊與成果促進組(patient-reported information and outcomes, PRIO)的組內會議，組成目的為 PRIO 到臨床資訊發展，作為簡化作業的基石與病人反應的結果。8 月第一次會議，主要是認識大家及了解小組會議進度與重點內容。10 月第二次會議，發現資訊工程組組長說明很多程式設計或修改不可行的理由，負責本組規劃的醫師未表達任何意見，可以看出不滿意的表情，導師向我說明這裡的資訊發展很慢。相較之下，現在長官們逐漸打破各領域的疆界，共同持續地精進與發展資訊科技及應用的決心。11 月第三次會議，發現大家提出許多與情緒壓力評估的問卷內容，主要是了解及偵測癌症病人的自殺傾向，希望能建置在臨床作業系統中，由護理師協助病人自我評估心理問

題及自殺意念。由於本院在這方面的發展經驗及執行效果，不甚理想，我向導師提出，若要讓資料有效，不增加護理師及病人負擔，又能解決臨床問題，我建議選擇院方已建置及試行 ESAS 平板自我評估方式及兩年內約 6000 人自評後的初步結果。經由導師的鼓勵，我在會議中用了破破的英文，提出我個人經驗及建議，獲得小組的認同。

(7) 第五~六個月:

由於在 PRIO 會議中的提議獲得組長同意，以及本院預計擴增臨床試驗病房的前提下，我提出臨床見習需求。PRIO 組員亦希望我能提供建議，先見習(clinical shadowing)兩個試行平板式 ESAS 自我評估的單位為 Radiation clinic 及 Supportive Care Medicine Center，病人運用平板工具及輸入 ESAS 12 項自評症狀程度，醫護人員與病人的互動場景，參觀門診設備及空間運用。接著，安排臨床試驗單位的見習活動。這些，對我們本年度部科特色的設計與發展，都有幫助!

i. Radiation clinic 見習:

放射腫瘤部門有 24 位來自各地的主治醫師，每位醫師負責至少 2-3 種癌別治療，部門所屬範圍很大，每位同仁都有自己的辦公桌空間，因為辦公室及診間需求多，空間不太大，能善用各類牆面(圖九)，裝置活動桌、電腦設備、診療椅、牆上診療器具、家屬陪客椅等(圖十)。診療椅與牙科椅雷同，可以自動升降、坐起/平躺，也有更換檢查單的捲軸，節省病人看診後護理師更換床單的時間，和本院門診設備的概念相同。由於各類的放射線治療模組、診間與辦公室在一起，為了服務更多的病人，院方擴建新大樓後，決定把現行空間重新規畫留給病人使用，辦公室要統一搬到新大樓，目前預計採購一套質子治療設備，提供新治療、新服務。

護理師說明放射腫瘤部門診看診流程，先由臨床醫療助理(Clinical Medical Assistant, CMA)協助及確認病人已完成基本資料輸入(含 ESAS 自我評估)，護理師帶領病人進入診間，從會談、觀察及確認病人自評結果，提供衛教活動後，再與醫師溝通，最後由醫師確認病情與症狀強度的關係，作為治療劑量、藥物修正與否或心理輔導的決策。另外，見習三位乳癌病人，都有放射線皮膚炎的問題，第一位是 1 級皮膚炎，護理師依據院方建議指引建議病人使用含蘆薈或金盞花等成分的乳霜或乳液；第二位是 2-3 級皮膚炎，

除了醫師處方用藥，皮膚炎位置在腋下皺摺及傷口處，護理師提供不沾黏敷料，指導病人自我照顧技巧；第三位非裔病人，完成放射線治療回診，0 級皮膚炎，但治療部位因黑色素沉著，膚色呈焦黑狀況，情緒顯不穩定，表達很多乳癌及治療對她造成的生活困擾、壓力與焦慮，醫師完成治療部位的身體評估後，告知影像報告顯示「無乳癌腫瘤跡象，病情穩定，門診追蹤即可」。病人立即顯現心喜若狂的表情與喜悅，回家前告知醫師和我,指定要找當日指導我的護理師道謝及分享好消息!我們都為這位病人感到高興、擁抱與祝福她!可見護理師持續鼓勵、指導與陪伴病人的重要性，但是可以再精進放射線皮膚炎照護策略及追蹤病人的遵從性。

ii. Supportive Care Medicine Center 見習:

此部門為支持性照護醫療部門 (Department of Supportive Care Medicine)之一，臨床醫療與服務包括三大方面：支持性照護醫療(Supportive Care Medicine)、行為醫療(Behavior Medicine)及整合性照護(Integrated Medicine) (圖十一)，囊括症狀處置、瑜珈、按摩、針灸等輔助性治療(圖十二)，還有活力門診(Vitality Clinic)，即為多元復健門診，內容包括心理治療與諮商、營養諮商、語言復健、職能復健及物理復健(圖十三)。此為該院第二個試行 ESAS 平板自我評估系統的門診單位，護理師也是當病人完成 ESAS 評估後，確認病人症狀程度與需求，提供衛教活動。但是，主治醫師更重視病人 ESAS 評估的結果，會要求護理師會談時，應更深入了解病人的症狀與疾病的關聯性，才能協助醫師正確評估與決策病人的治療方向與用藥調整，否則醫師還要重新評估，影響看診進度。

見習三位病人，分別由主任及資深主治醫師指導，也觀摩了門診的環境。第一位是 HIV 病人罹患胰臟癌，免疫力差又有嚴重腹瀉問題，服用多種止瀉藥仍無法有效控制腹瀉，病人感到困擾且一直消瘦，後來病人因腫瘤擴大，有疼痛問題，改用嗎啡類止痛藥後，腹瀉問題得以改善，生活品質變好。由於 ESAS 自我評估項目的 12 項問項中只有「便秘」，無「腹瀉」評估，護理師針對病人自評「便秘」問題達 7 分，在症狀評估分類屬於嚴重症狀，告知醫師。當我跟隨主治醫師(部門主任)看診及討論後，告訴我病人病情，如何利用病人自評結果與臨床症狀對應，取得治療的平衡點及告知疾病的訊息。

因為我有臨床經驗及研究能力,才知道醫師的用意,癌末病人不能直截地告知病情預後，婉轉地詢問家人有誰已經知道他的病情，除了利用症狀評估結果來協助病人瞭解自己的身體變化，藉由嗎啡類藥物副作用，同時達到疼痛與腹瀉的症狀控制，改善病人生活品質，以「天」計算的生命，「每日過得好」就是好，也是醫療的目標。此時，我才茅塞頓開，理解過去 3 個月 ESAS 資料整理的初步概況能與當時情境的結合，破除「症狀分數高，是控制不好的結果」的迷思。第二位病人因為疾病末期造成的症狀感到困擾，醫師建議試做化學治療，但病人猶豫。最後，醫師直接請社工師關心病人的治療意向(此部門有專任的社工師駐守)，病人仍拒絕，最後僅採症狀治療。第三位病人有疼痛問題，但有不遵從用藥行為，以致多項症狀評估結果大於 7 分，護理師告知病人主觀意識強，溝通不易。醫師了解後，因有家屬陪同，同時向兩位說明告知病人調藥計畫與進度，期許病人能配合治療計畫，才能有效控制疼痛，緩解其它的症狀問題，看見佛州規範醫師開立疼痛藥物，必須簽名及蓋章，也和專科護理師詢問她們的執業範疇，專科護理師僅能開立症狀處置藥物，不能開立高風險藥物。這個部門避免醫師開立疼痛藥物後，未追蹤病人用藥情形，造成嗎啡類藥物氾濫情形，早在 14 年前，即派任一位專責人員負責聯繫醫師、病人與藥局的溝通，追蹤病人服用疼痛藥物進度，回報醫師。這位專責同仁已經是 70 歲了，敬業精神及態度令大家感佩，她獲得了 2018 年醫院貢獻獎的榮耀(圖十四)，促進組織向心力，也是工作同仁的典範。

門診環境以艾米莉•狄更生 (Emily Dickinson)女士對「Hope」的詩作為基礎，建置病人留言板(圖十五)，讓病人在等待看診時，可以紙筆寫下心情、鼓勵自己或他人(圖十六)，牆上的畫作也是病人透過藝術治療完成的作品(圖十七)。每個診間空間也不大(圖十八)，牆上的時鐘是方便醫師了解病人的看診時間，月曆則是用來和病人約診用，讓病人有現實感，天花板有簡單的照片 ，以日光燈照(圖十九)，紓解病人問診時的壓力。另外,診區備有溫箱及溫毯(圖二十),方便病人檢查時,若須掀衣或解褲時,除了隱私，也有避免病人發生失溫的效果。

以上見習結果與導師會談後，透過個人心得與分享，連結數據結果與臨床反應的差異了，畫出 ESAS 系統精進建議，獲得 PRIO 發展組的肯定(圖二十一)。症狀嚴重度不

是只有醫療處置或照護方法可以解決的問題，除了醫護人員多方面合作與協調外，最重要的是病人和家屬的認知與配合，也是癌症照護的重要關鍵人物。如此一來，才有可能達到症狀緩解與生命延長的目標。

iii. Clinical research unit 見習:

臨床試驗單位屬於門診與住院之間的部門，負責執行與醫院合作的臨床試驗計畫，共 6 個病室，9 個床位，其中有 4 個單人空間(圖二十二)，點滴架設備的重心要穩，有時要掛 2-3 台點滴輸液儀器，以圓形把手為主，架身包括氧氣架的固定環(圖二十三)。單位經理告知護理師徵選條件包括：(1)在該院工作至少三年、(2)護理專業能力進階達 N2 以上、(3)重視溝通能力(與病人/家屬、廠商及研究人員)及(4)對採樣及藥物治療時間的紀錄要精確，因此護病人力比 1:4。經理可以透過電腦作業動態畫面，了解及追蹤每位同仁的工作負荷與進度(圖二十四)。由於導師在這個單位進行的研究計畫主要以婦癌病人及口腔癌病人的症狀長期追蹤及生活品質，生病行為與生活習慣的關係，這類與臨床試驗同步進行的跨團隊的研究計畫，還可以即時了解病人遇到的障礙與困擾，提供支持或轉介諮詢。

在環境方面，看見智慧藥櫃(圖二十五)及高價醫材的管理(圖二十六)，也是本院發展的方向之一。ECG 設備因應每家廠商使用的機型與規格不同，護理師都要學會所有 ECG 機器操作與簡易判讀，不能出錯。否則，研究結果影響藥物治療效果的正確性、副作用等問題。我發現 ECG 機器多及重量不一，放置位置的高低(圖二十七)會影響護理師的工作效率與身體健康，未來本院建置此病房，也要執行 ECG 紀錄的話，建議機器放置位置能有油壓裝置，按「1」就有「1 號機型的 ECG」在人體工學高度的收放位置，保護護理師的身體健康。給藥流程需與廠商合約在 IRB 計畫書中對應的位置(附錄六)，協助護理師認識每一個階段在廠商合約條款或 IRB 計畫的內容中，記錄已發生或可能發生的事件。在抽血設備，使用靜脈留置針內含止血閥的安全針具(圖二十八)，阻止血液外流、感染以及定時抽血採樣，減少病人扎針的次數，保護血管，還有直接目視嘔吐量的嘔吐袋裝置(圖二十九)。第二次見習，病房經理帶我參加每周五臨床試驗計畫的定期會議，成員包括主治醫師、計畫主持人、計畫協調人員及病房經理，討論每一個個案治

療情形、副作用及終止，隨時掌握臨床試驗計畫的進度，減少試驗偏差。若有新計畫者，需要在這個單位進行的主題，都要在此會議中報告。但是，美國現在進行的嵌合抗原受體T細胞(Chimeric Antigen Receptor T Cells, CAR-T)試驗是在骨髓移植中心執行的病人，主治醫師、計畫主持人就不會參與此類會議，可能是其他會議的成員監控計畫進度。

(8) 其他見聞

在個管師的角色共有三類與本院個案管理護理師的角色與職責類似：(1)個案管理師(case manager)屬於護理部，處理住院病人與醫院及保險的合作橋梁，確認照護品質、成本效益及住院天數等行政業務，也是出院準備服務在協助病人平安返家及提供社區資源的重要角色，降低再住院及避免治療中斷；(2)個案領航員(patient first nurse navigators)屬於病人優先部門(patient first)，協助癌症病人從初診斷、治療、復原期的身心需求，適應罹癌事實，追蹤留治率及完治率等指標；(3)臨床醫療專科護理師(clinical medical specialists)屬於醫療部門，負責新診斷個案登錄及多專科團隊會議業務。第一類人員類似出院準備服務個管師，第二、三類人員則類似本院腫瘤個案管理護理師負責全部的業務。三類人員分屬不同部門，並未提及人才培訓計畫。

在餐廳部分，食物選擇攤位不多，空間也不大，有披薩、漢堡、炸物、壽司、捲餅、沙拉，熟食不多，但有米飯。剛到的時候，覺得新鮮，吃生菜還可以，也有一些水果。但是，覺得生菜不宜吃太多，生病了沒人照顧!後來，我儘量選擇熟食，只要有米飯，我一定選。點久了，員工認識我，彼此會打招呼，因為她是菲律賓人，到美國 3 年，會講一些台語，看到我，聊一下，也多給一些食物。但是我看這些美國人的食物，多是冷食，癌症病人如何適應?大部分都還是吃醫院的用餐吧!工作人員穿工作服用餐，很難判定是一線人員，還是行政人員? 手術室工作人員多會穿一件不織布類的外套，管理也是一個問題。在感染管制方面，可能有一套好的方法?!另外，有些化療病人帶著機器，管路 4-5 條，可以走來走去，有的坐輪椅，也到餐廳用餐，不擔心管路外滲或潑灑問題，我看了，實在捏把冷汗! 但是，醫院的點滴架看起來重心穩(把手是圓圈式)(圖二十三)，輪子要好推，否則會顯得太重。

三、心得

返國後，發現本院國際化趨勢已大幅邁進，僅有一項紀念小物可以再進步，就是職員證吊牌，目前我們也還沒有這項小物。吊牌有很多不同的式樣，有塑膠或金屬，但是醫院同仁一率須配戴醫院象徵的吊牌(圖三十)且功能不一(圖三十一)，一個小小的物品，卻是顯學，促進組織向心力。因為每位同仁上班時都必須配戴職員證，也會要求受訓人員配戴此吊牌，要求一致性。

這次來到健康結果與行為研究部門，多是研究人類行為與心理變化，與護理研究領域雷同，但是導師的研究群組缺了護理背景的研究人員參與研究計畫與討論。感謝導師分享的數據，可以快速了解該院近 2 年的病人概況(性別、年齡、人種等)，診斷、症狀及病人自評結果。學習過程最大的收穫是閱讀大量的文獻與分析數據，從 ESAS 臨床症狀評估結果的數據資料到臨床路徑建置的想法，學習、研究與溝通對發展臨床路徑都是有意義的步驟。

在美國，從醫院建置的「病人自我評估症狀系統」擷取的數據中，學習了解數據呈現的現象與病人樣貌，但是這些數據結果除了發表文章，還能做什麼?!其實，最重要的是必須能實際反映病人的健康行為，提供治療方向，了解疾病預後的結果，這是大家都知道的方向。但是，為什麼這麼窒礙難行? 因為需要透過跨專業領域的合作與溝通，而延誤了策略發展的時機。因此，建置臨床路徑的必要性，在實證文獻及證據基礎上，需要有管理者的支持與資訊工程的配合，才能提供即時訊息、實證措施及臨床決策，尤其是多專業團隊的照護模式。目前常見的癌症治療臨床路徑，多以「疾病治療」為主，例如：腫瘤醫師們常使用的美國 NCCN 診斷及治療指引，其他醫療專業團隊在「症狀照護」路徑的指引或建議過於繁雜，引用不易；加拿大 CCO 網站建立的症狀照護指引，可以提供參考，美國醫療機構卻引用甚少。美國腫瘤護理學會(Oncology Nursing Society)發展的照護策略多以「書籍」方式呈現，並未廣泛地提供網路訊息，縮小了使用對象。

接觸及認識 ESAS 一段時間後，綜合本院內部作業，盤點醫師想要知道的訊息，護理人員工作負荷不會太重的評估工具，才發現我們從病人從診斷到治療，在各部門間缺少了一致

的評估工具，無法反應病人主觀性的表達(Patient-reported outcomes, PRO)，可能影響了個人治療意向、醫療資源運用及醫院成本效益。例如 CGA 太冗長，一次評估時間花費 1~2 小時，不易推行；癌症評估分散，無法真實了解病人病情變化。在病人或院方追求「快速」的同時，包括：檢查快、診斷快、治療快、照護快、出院快，造成惡性循環，急診壅塞，床位運用受限。然而，中榮護理仍然堅持傳統護理的精神在於「把每一位病人照顧好，順利出院」，需要創新思維才能改變。ESAS 問卷內容對癌症病人而言，是最簡單且可行的自我評估方式，亦可由代表病人的家人或朋友代為填答。

病人報告的訊息與結果(Patient-reported information and outcomes, PRIO)是以病人為中心，達到 P4 的醫療照護(Predictive, Preventive, Personalized, Participatory)為目標。從想問題、做統計、能發表、再應用，都是以實證研究解決問題的辦法，連結外面的醫療環境。由於護理研究樣貌多元，研究方法都有性質與種類不同，在質性與量性研究的發展，透過期刊發表與經驗分享，回歸人們的需求。從研究人類的行為與結果，透過調查、找出原因，針對問題、建立措施到臨床應用，需要花費很長的時間在研究與教學，不斷地循環深根，才能發揮中榮護理的精神。因此，希望這次的學習對自己能有助益，對業務能有精進的策略，感謝護理部及院方給我這次出國的學習機會，從別人的經驗中，找到自己立足的方向，努力及前進。未來，期許自己也能真正幫助願意投資人力及心血，在中榮成長的夥伴，讓中榮護理研究也能成為他人學習的標竿醫院。

四、建議

配合國家癌症防治計畫在 2020 年達「下降 20%癌症死亡率」目標及出國進修目的，建置癌症治療副作用/症狀之實證照護臨床路徑，是本次擬進修返回後積極推動的方向。期發揮本院腫瘤照護的三大效能：

1. **主動式腫瘤個案管理及癌症資源中心服務：**檢視本部部科特色「行動照護家 App」的內容與功能，仍在身體症狀或合併症評估的起步階段。盤點口腔癌病人對「行動照護家 App」

的使用效益後，與護資組、資訊室溝通及評估併入 ESAS 症狀評估項目的策略，配合病人的病程階段，協助個案管理師從疾病診斷、治療、復發至疾病末期，執行主動式追蹤，通知病人注意常見症狀及自我照顧方法,並運用癌症資源中心提供實體教學、服務及回覆示教，嘉惠病人及家屬。

2. **促進整合性癌症照護模式及腫瘤專科病房照護特色：**配合台灣腫瘤護理學會腫瘤進階訓練課程與趨勢，培訓腫瘤護理種子，帶領種子依據 ESAS 癌症症狀評估項目，連結護理作業系統之護理問題及導因，篩選適切的病人活動，以能促進疾病復原。個案管理師亦能透過病人 ESAS 的自評結果與多專科團隊間的合作關係，延伸病人/家屬自我照護責任，建立完善的「整合性癌症照護模式」。進而規劃進階腫瘤護理實務教育及經驗分享，發揮癌症專科照護特色。
3. **鼓勵病人參與 ESAS 自評系統及反應照護結果**:由癌登資料庫或臨資中心資料庫合併 ESAS 癌症病人自評症狀及數據，歸納病人常見問題及困擾，提出實證照護措施執行結果或依實證步驟完成照護指引，發展癌症照護決策系統，提升精準照護水準，並能爭取院外研究經費與發表。

實證研究與教育是一體兩面、相輔相成的專業發展，再加上臨床應用，會是醫療照護環環相扣的環節。除了提問、評析、整理資料、找答案，更要學會解決問題的能力，就必須具有基本研究能力的訓練與養成，才能精進專案管理，提升照護品質。閱讀進修機構網頁公告，研究組每月依計劃書、執行進度及成果撰寫三部分，排定計畫主持人的報告時間，提供主持人關於研究計畫書及成果報告修改建議，每年舉辦一次護理研究成果研討會，提供院內同仁學習發表的平台，對外酌收報名費，促進周邊各家醫院或學校的學術交流。對護理部建議：

1. **輔導及追蹤研究計畫執行與寫作進度**：多數同仁在統計方面依賴生統人員，寫作方面又必須約定時間，才能進行討論。為便於對護理研究有興趣且有計畫經費同仁持續精進，邀請部內研究人才，並與研究部生統小組溝通，期配合研究組規劃的輔導進度，協助論文撰寫與統計訓練的指導。
2. **精進實證教育與臨床應用：**配合護理標準作業、技術或流程制定及修改，經由實證證據的

結果，推動措施效果與臨床應用，設計教學活動及護理研究研討會，分享成果。

在進修部門學習 6 個月期間，導師的合作團隊在一年內發表 8 篇高點數的 SCI 優質期刊，閱讀成果後，發現「健康結果與行為」或「行為科學」研究人才屬於費用少、效益大的研究投資，主要在於問卷收集、統計分析軟體寫作及結果解讀。檢視國內 8 家醫學中心及國外 5 家指標性醫院的網頁訊息，國內醫學中心研究部門多重視實驗室的研究與發展，儀器採購及定期維護所貲匪淺。在行為研究方面，多數醫學中心為學校的附屬醫院，有校方支援的合作部門，僅本院與高雄榮民總醫院無特定的學校合作，在護理研究發展與人力資源方面，亦可轉介由學校教授共同指導。

地點	國內								國外				
醫院	中榮	台大	北榮	高榮	長庚	高醫	中國	慈濟	MD Anderson	Moffitt	Mayo	Memorial Sloan-Kettering Cancer Center	Dana-Farber / Brigham and Women's Cancer Center
行為研究	無	無	無	無	無	無	無	無	有	有	無	有	有
部門名稱									Behavioral Research and Treatment Center	Health Outcomes and Behavior		Population Sciences Research Program	McGraw/ Patterson Center for Population Sciences
									Behavioral Science				
合作學校	無特定	台大	陽明	無特定	長庚	高醫	中國	慈濟					

本院正在積極規畫第三醫療大樓興建工程，收治病人時，即需要大量的護理人力與人才，護理主管也需要兼顧臨床、行政與研究，工作忙碌及會議之餘，再撥空輔導同仁實有困難。雖然，護理同仁會利用工時或自假進修博、碩士，學習中難免遇到瓶頸，亦需要專責人員輔導。院方研究資源在護理部的投資不遺餘力，但是統計軟體限於 SPSS 22.0 版本，無法精進一些高等統計分析的行為研究設計，且 SPSS 軟體被 IBM 併購後，更新版本與現行版本又不相容，必須花費更多費用採購不同模組，已無再投資的價值。相對地，SAS 軟體是有版權且符合多數研究者必須學習的統計語法，值得採購。再者，比較三家榮民總醫院，臺北榮民總醫院協助護理研究發展人力及資源豐富，高雄榮民總醫院亦有一名專責研究護理師，顯見本部的護理研究人力支援有限。此時，培訓行為研究或科學人才是適當時機，轉銜醫院業務擴

充時，不因研究人才培訓缺口對醫院造成影響。因此，對院方建議如下：

1. **護理部與研究部合作，建立「健康結果與行為研究」或「行為科學」的組織：**研究部招募或進用院內、外對行為科學及研究有興趣的研究人才，共同拓展研究部及護理博士人才的研究領域與業務，亦可長期與護理部合作，進行研究計畫撰寫、統計分析、期刊發表，開發更多護理研究人才的潛能。
2. **護理部參與「臨床試驗研究計畫」的發展：**目前強調大數據、機器學習的醫療世代與智慧環境，但是都必須回歸「以人為中心」的生活行為與互動。若有健康結果與行為研究的計畫合作夥伴，比對實驗數據與健康行為或其他變異的真實性及有效性，同步確認現時及現場的一致性，提高預測精準度，鼓勵病人參與，提供個人化的醫療照護及提出預防疾病的建議。未來，本院要發展臨床試驗病房，護理部亦可學習及參與跨團隊模式或現行整合型計畫規模，提出與臨床試驗主題相關的研究計畫，期擴大研究效益與成果，嘉惠更多接受同類治療的病人。

五、附錄

附錄一 自我介紹 PPT

附錄二 經驗分享 PPT

附錄三 SCI 期刊發表成果

附錄四 SAS 語法作業

附錄五 完訓證書

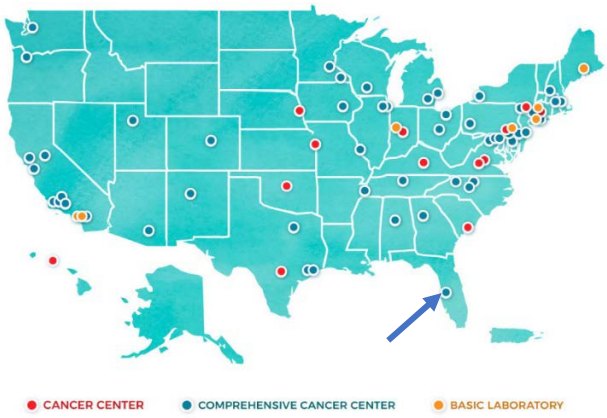
附錄六 Evaluating Oncology Clinical Pathways Programs 表格

附錄七 Edmonton Symptom Assessment System (ESAS) 12 項症狀評估項目

附錄八 症狀照護指引心智圖-疲憊為例

臺中榮民總醫院 出國進修/研究人員心得報告_護理部 張碧華護理督導長

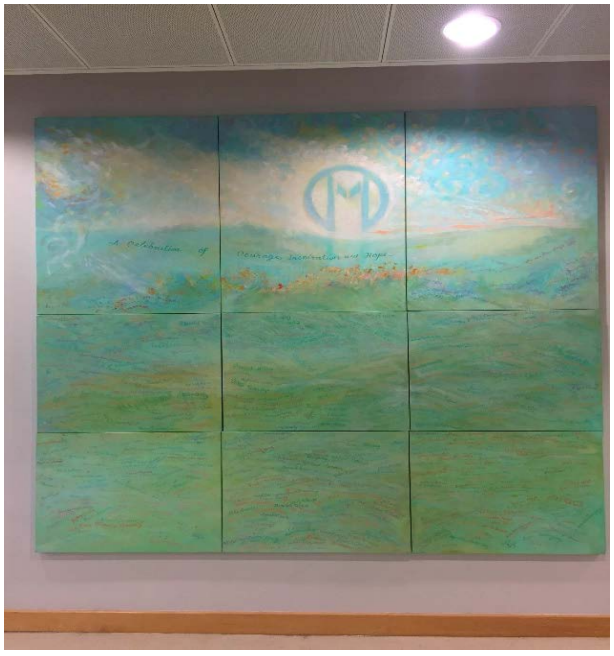
圖一 墨菲特癌症中心外觀



圖二 墨菲特癌症中心-佛州唯一全面性的癌症中心

圖三 公共走廊掛護理部住院病人服務獲得美國磁力醫院認證的榮耀

圖四 放射線病人接受治療期間完成的畫作(左下角放大圖)

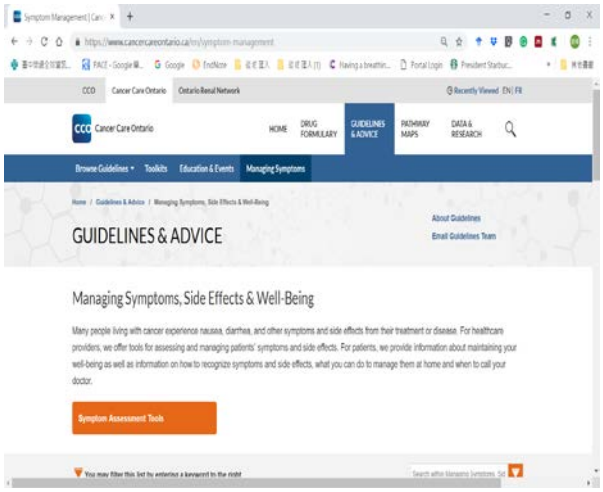


圖五 病人用簽名方式集體創作的畫作

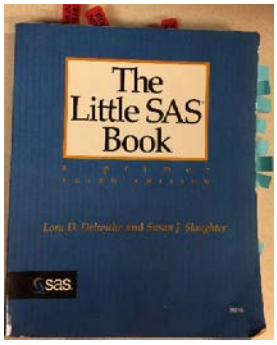
M 是太陽，也是橋梁
用鼓勵、激發與希望慶祝坦帕市新造一座跨海大橋

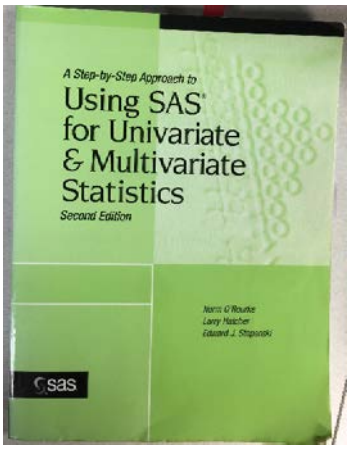
病人簽名

圖六 IRB CITI 認證



圖七 CCO 網站





圖八 SAS 語法書籍

圖九 走廊牆面的活動桌

桌面打開

圖十 診間設備(含牆面的活動桌及電腦設備、診療椅、檢查器具、陪客椅)

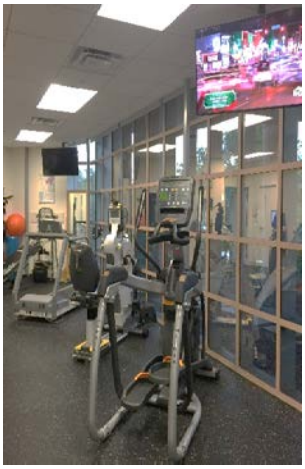
電動診療椅椅背裝置椅墊鋪紙

圖十一 門診環境(外)

門診環境(內)

圖十二 輔助性治療內容(正、反面)

圖十三 活力門診(會談室)



活力門診(復健運動與按摩設備)

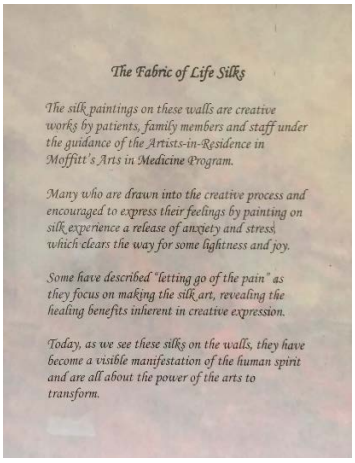
圖十四 工作人員年度醫院貢獻獎

"Hope" is the thing with feathers -
That perches in the soul -
And sings the tune without the words -
And never stops - at all -

圖十五 留言板

圖十六 留言用具

圖十七 門診走廊牆面的病人畫作

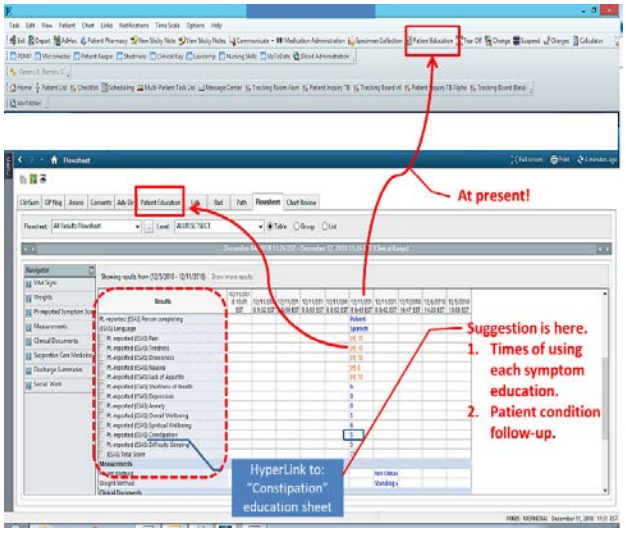


畫作說明

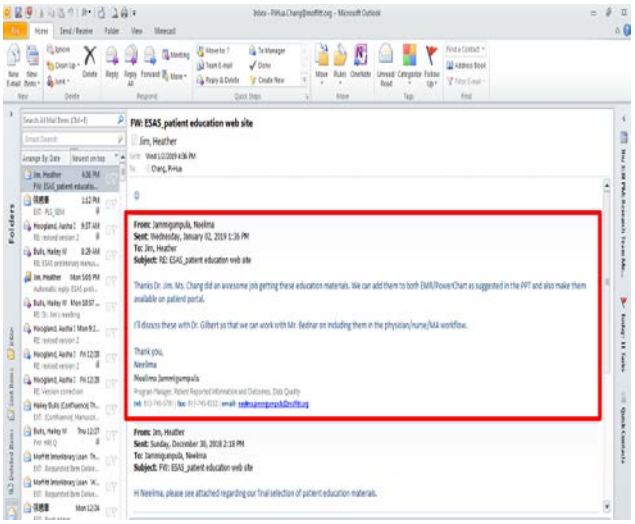
圖十八 診間空間(入口左、右)

圖十九 SCM 診間天花板照片

圖二十 SCM 診區走廊的溫箱及溫毯

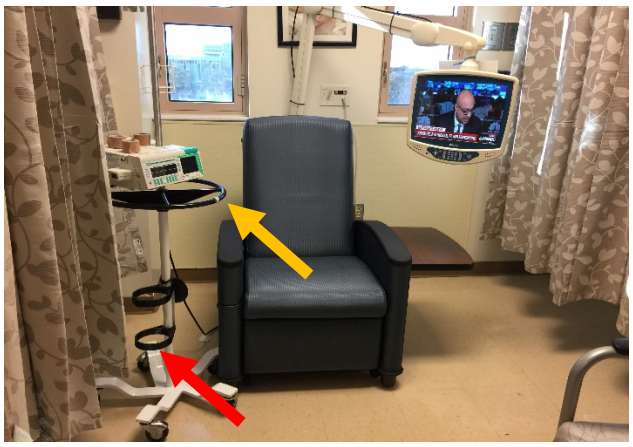


圖二十一 ESAS 評估系統精進建議

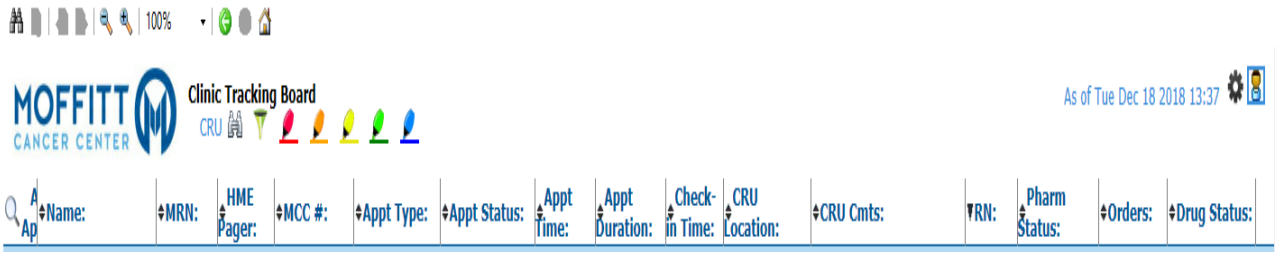


PRIO 發展組肯定建議的回信內容

圖二十二 臨床試驗病房空間示意圖



圖二十三 點滴架設備(圓形把手與氧氣掛架)

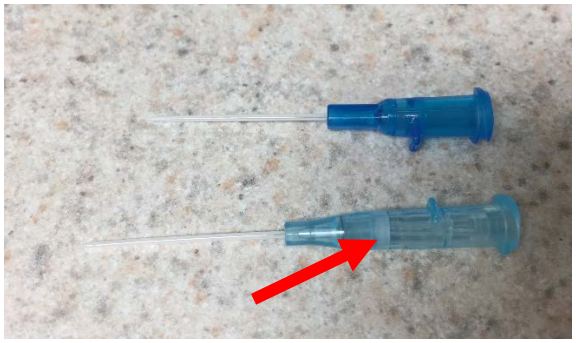


圖二十四 護理師工作量動態

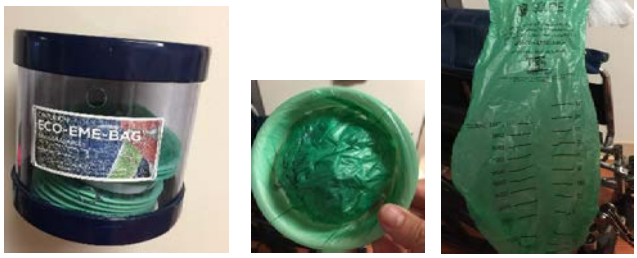
圖二十五 智慧藥櫃

圖二十六 高價醫材的管理(左、右電腦面板)

圖二十七 ECG 機器放置位置(左、右圖)



圖二十八 內含止血閥的安全針具



圖二十九 嘔吐袋牆面掛架、原裝、打開

圖三十 吊牌正面 (基本款，機構特徵)

圖三十 吊牌反面(黃色記號代表底座可 360 度旋轉)

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Compassion Quality Innovation Accountability

臺中榮民總醫院
Taichung Veterans General Hospital

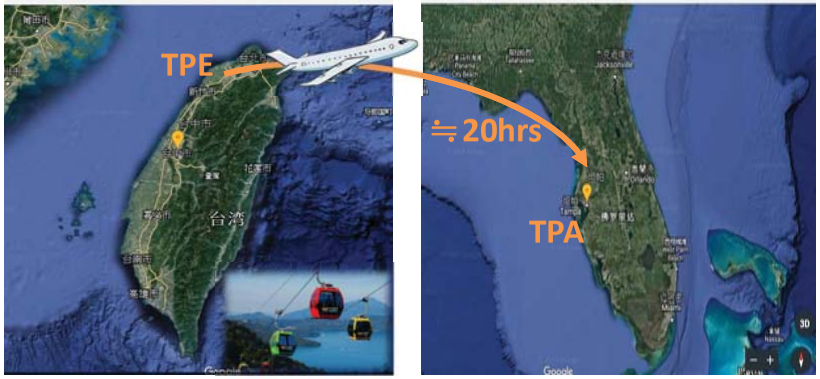
AVSP

Self-introduction and Research interests

Presenter: Pi-Hua Chang, RN, PhC.
Country: Taiwan
Date: 09/20/2018

My Country

Taichung, Taiwan **Tampa, Florida**



My hospital

1. TCVGH was opened in 1982, a tertiary healthcare provider with over 1,500 beds and 3,600 employees.
2. It is the only public medical center in central Taiwan and handles over 6,500 outpatient visits daily.

Webpage
http://www.vghtc.gov.tw

Current Superintendent
Wayne Huey-Herng Sheu (許惠恒)

About myself .....

- **CURRENT POSITION**
- **Supervisor**
- **Department of Nursing, Taichung Veterans General Hospital (TCVGH), Taichung, Taiwan.**

- **PROFESSIONAL EDUCATION**

Ph.D. Candidate, Nursing	**National Taiwan University (NTU)**
MSN, Nursing	**Taipei Medical University (TMU)**
BSN, Nursing	**National Taiwan University (NTU)**

附錄一

Clinical Nursing Experience

Cancer diagnosis	Position	Year
Gastric cancer, Hepatoma	Clinical Nurse	3
Leukemia, Lymphoma, Sarcoma	Clinical Nurse	14
Lung cancer Head and Neck cancer	HN	6
Pediatric cancer Lung cancer & Head and Neck cancer	Supervisor	2
Oncology Nursing Education Patient Care Quality Oncology Evidence-based Practices	Supervisor	2

Professional Experience

Position	Organization
Oncology Nursing Committee, Members	Taiwan Nurses Association
Education group, Members	Oncology Nursing Society of Taiwan
Editorial Board, Members	Oncology Nursing Society of Taiwan
Editorial Board, Editor-in-Chief	The Journal of Oncology Nursing
Editorial Board, Reviewers Editor-in-Chief	Veterans General Hospital Nursing

Major research interests

- **Exercise Behavior and Cancer Rehabilitation**
- **Symptom and Fatigue Management in Cancer Care**
- **Quality of Life of Cancer Patients and Caregivers**
- **Cancer Patient Navigation and Management**

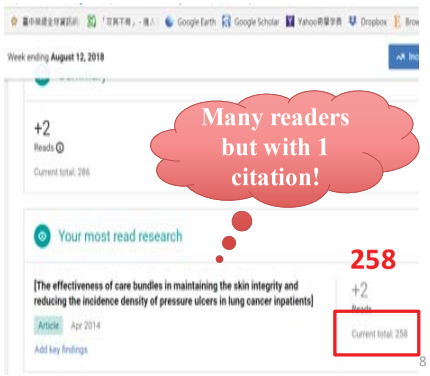
Why I hope to visit Moffitt …..?

JPSM, 2008

Effects of a walking intervention on fatigue-related experiences of hospitalized acute myelogenous leukemia patients undergoing chemotherapy: a randomized controlled trial

An article in Chinese, 2014

The effectiveness of care bundles in maintaining the skin integrity and reducing the incidence density of pressure ulcers in lung cancer inpatients



Two studies about breast cancer patients

1. **APBI patients' Quality of Life**

- Accelerated Partial Breast Irradiation (APBI): It is a new brachytherapy for breast cancer patients in my hospital, but we don't know what the Eastern women's concerns are.
- The purpose of this study is to investigate this population's quality of life and treatment-related symptoms or side effects.

2. **Arm Rehabilitation Program on Joint activity, Fatigue and Quality of Life for Postoperative Patients**

Study plan

Month	Schedule & Plan
August	**1. Familiarize with the surroundings:** -- Infusion center, Rehabilitation center, and Patient resource center. **2. Visit and understand care process, equipment and facilities, patients and staffs management, and education/training program:** -- Clinical pathways and care modalities, patient management, and education/research programs. 3. Involve in a multispecialty team and related meetings/ward rounds. 4. Involve in a research program and related meetings/activities.
September	**1. Involve in a multispecialty team and related meetings/ward rounds.**
October	**2. Involve in a research program and related meetings/activities.**
November	**3. Learning academic writing: one paper and one proposal.**
December	
January	1. Evaluate this visiting and learning. (21rd – 22th weeks) 2. Prepare to go back to Taiwan. (23rd – 24th weeks)

臺中榮民總醫院
Taichung Veterans General Hospital

中榮官網 中榮FB

Thank you !

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Compassion Quality Innovation Accountability

The Severe Symptomatology Across The Cancer Continuum: A Retrospective Study

ESAS Data Report - Part 1
Data cleaning & Descriptive results

Speaker: Chang, Pi-Hua
Biostatistician : Thompson, Zachary J
Instructor: Dr. Bulls, Hailey W
Mentor: Dr. Jim, Heather S.L.

Date: 11/8/2018

Purposes of this study

1. Describe **the severe symptomatology** from cancer patients' concerned experiences.
2. Explore **personal and cancer-related predictors** of the severe symptomatology .
3. Analyze **the trajectories** of the severe symptomatology **over time**.

Outline

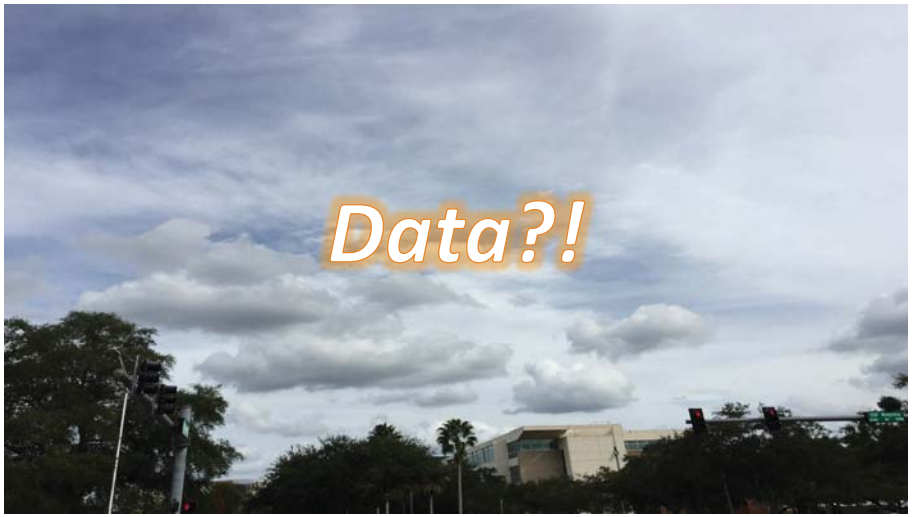
MOFFITT CANCER CENTER

❖ **Data**
- Data sources
- Data overview and preparation
- **Data cleaning !!!**

1. Extraction
2. Background

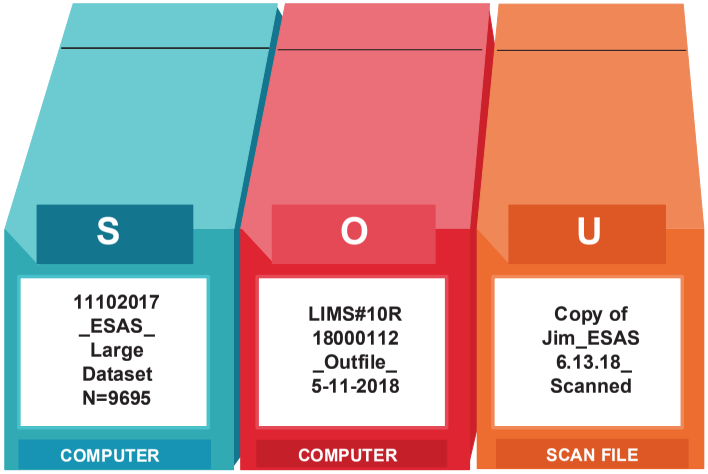
❖ **Results**
- ESAS sample size and characteristics
- The percentage (%) of severe symptoms

❖ **Problems**
- Tables
- Figures
- Evidences

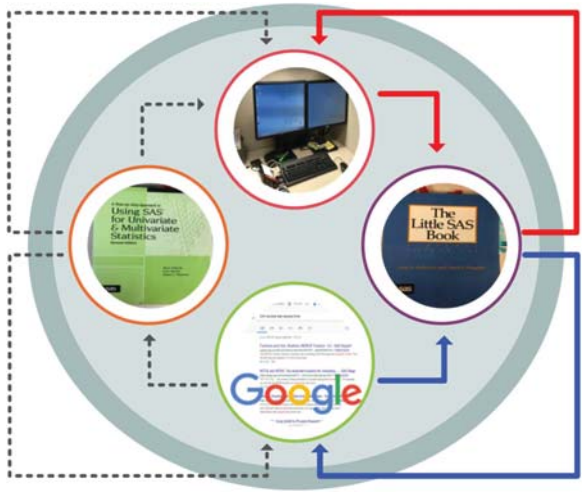


附錄一

Data Sources

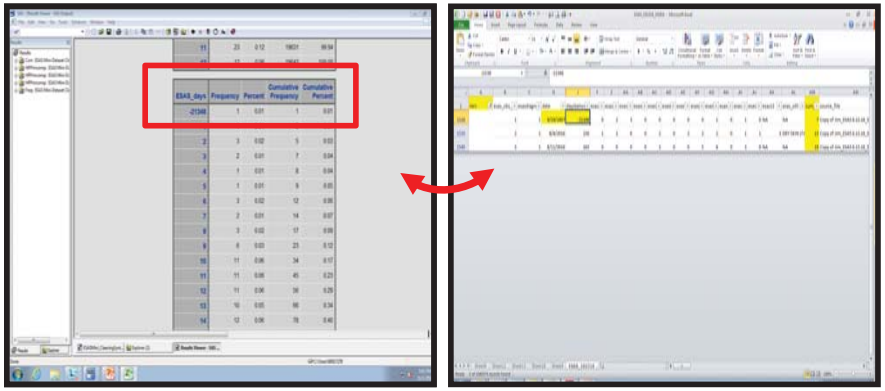


Data Overview and Preparation



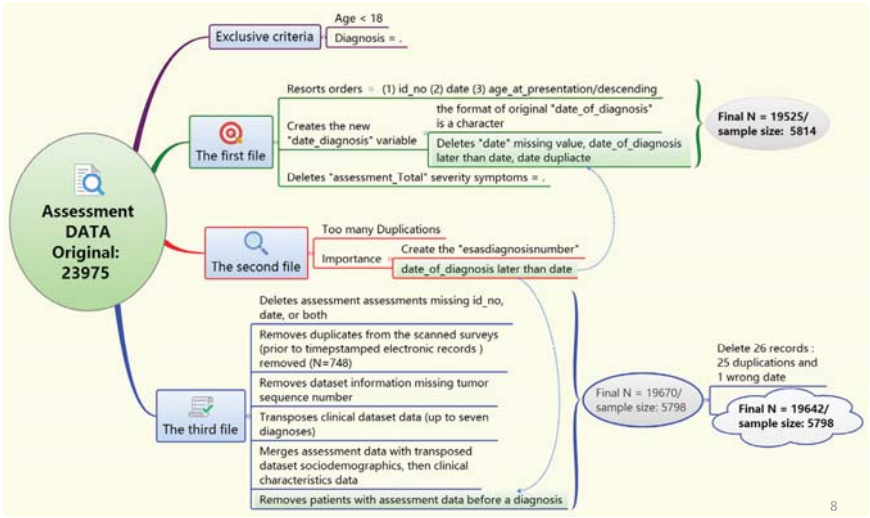
Two monitors double check

SAS Systems | EXCEL Systems



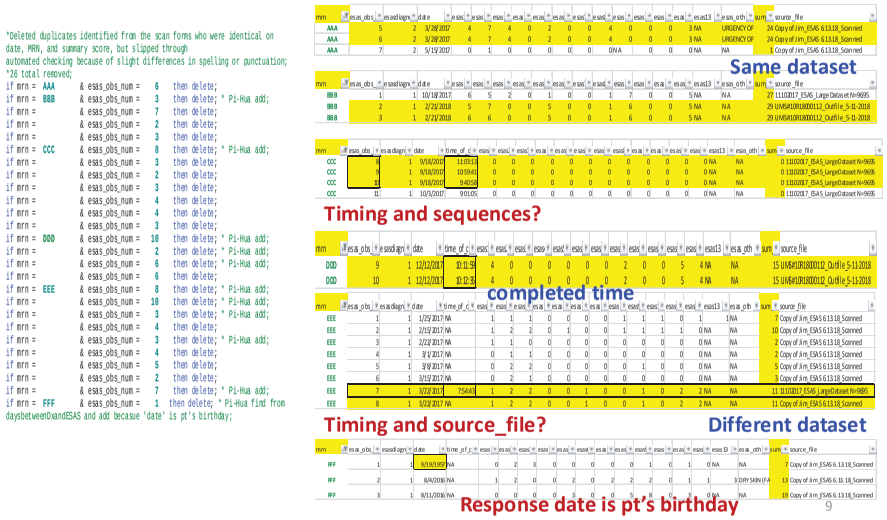
Data cleaning_1

ESAS Dataset extraction



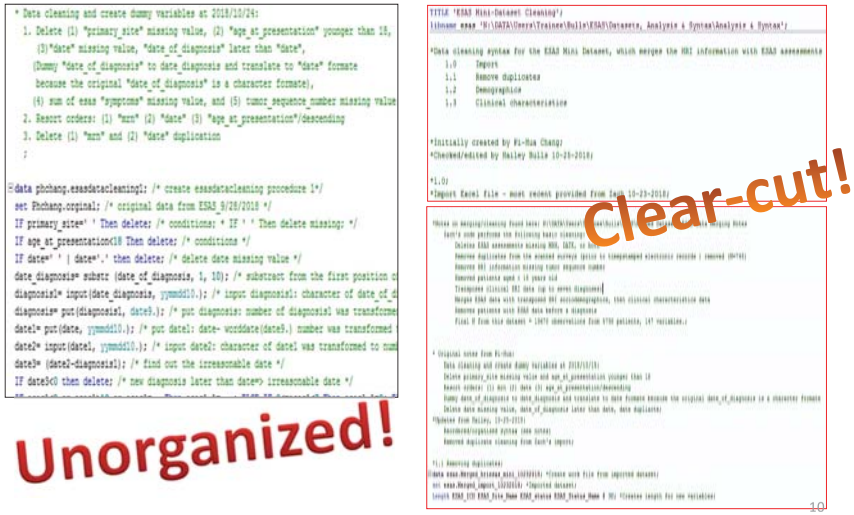
Data cleaning_2

ESAS Dataset backgrounds



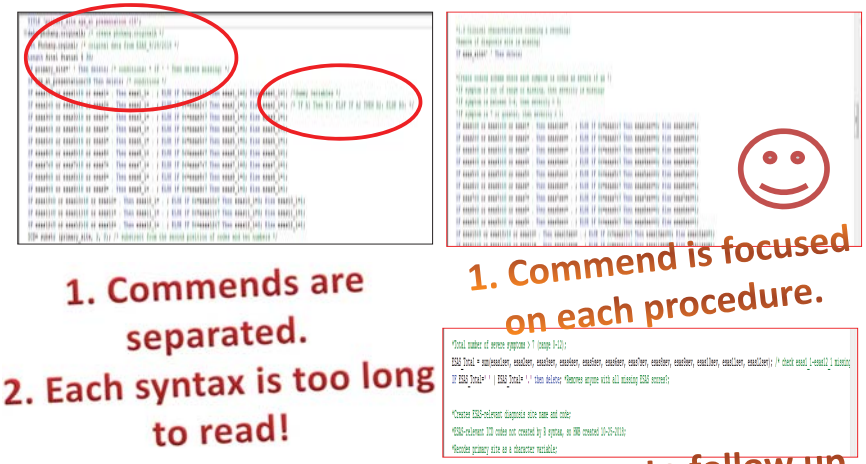
Commend functions 1:

Structure



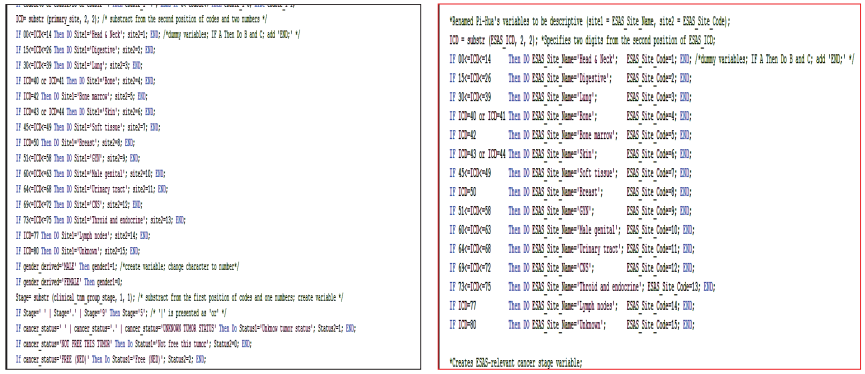
Commend functions 2:

Focuses on the top

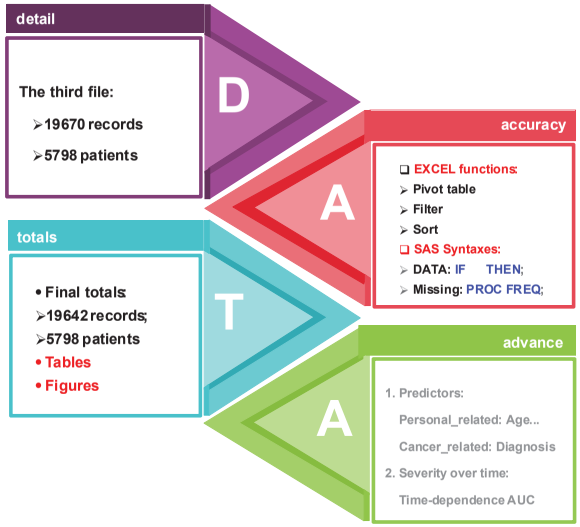


Commend functions 3:

Alignment



Preliminary Results



ESAS Patients' Characteristics (sample size = 5798)

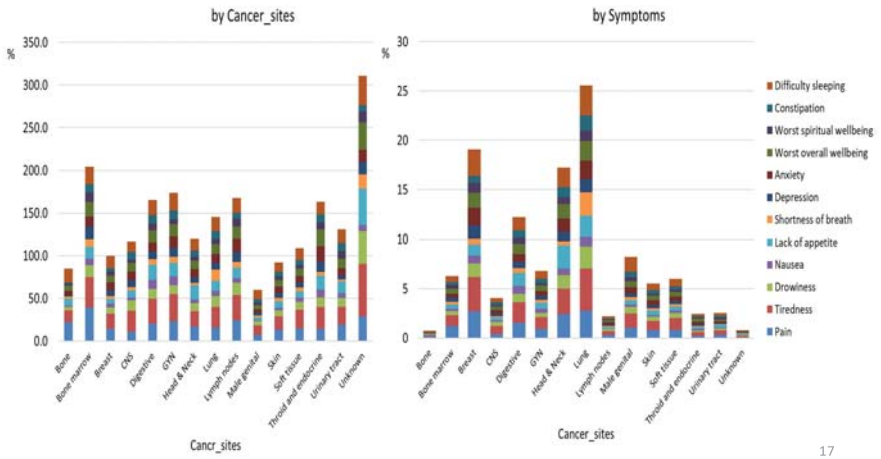
Variables	Mean	SD	Min	Max
Age	61.6	12.5	18	95
Diagnosed time (days)	927.9	1310.9	1	10701
	Frequency	Percent		
Gender				
Female	2665	46.0		
Male	3133	54.0		
Marital_status				
Married	3347	57.7		
Divorced	521	9.0		
Domestic partner	25	0.4		
Separated	30	0.5		
Single	663	11.4		
Widowed	293	5.1		
Missing	919	15.9		
Ethnicity				
Non-Hispanic/Non-Latino	5162	89.0		
Hispanic/Latino	492	8.5		
Missing	144	2.5		
Race				
White	4859	83.8		
Black /African American	419	7.2		
Asian	95	1.6		
Native Hawaiian or Other Pacific Islander	5	0.1		
American Indian, Aleutian, or Eskimo	11	0.2		
More than 1 race	14	0.2		
Other race	254	4.4		
Missing	141	2.4		

Variables	Frequency	Percent
Cancer_sites		
Head & Neck	693	12.0
Digestive	414	7.1
Lung	1067	18.4
Bone	35	0.6
Bone marrow	214	3.7
Skin	391	6.7
Soft tissue	217	3.7
Breast	1012	17.5
GYN	268	4.6
Male genital	944	16.3
Urinary tract	153	2.6
CNS	191	3.3
Throid and endocrine	80	1.4
Lymph nodes	104	1.8
Unknown	15	0.3
Cancer_stages (by pathology)		
In Situ	109	1.9
I	590	10.2
II	567	9.8
III	500	8.6
IV	544	9.4
Unknown	2762	47.6
Missing	726	12.5
Cancer_status		
Not free this tumor	2877	49.6
Free (NED)	2558	44.1
Unknown	149	2.6
Missing	214	3.7
Vital		
Alive	4952	85.4
Dead	846	14.6

Severe Symptomatology across the cancer continuum

		Pain (n=10,328)				Tiredness (n=10,328)				Drowsiness (n=10,322)				Nausea (n=10,317)				Lack of appetite (n=10,311)				Shortness of breath (n=10,309)				Depression (n=10,305)				Anxiety (n=10,317)				Worst overall wellbeing (n=10,307)				Worst spiritual wellbeing (n=10,298)				Constipation (n=10,309)				Difficulty sleeping (n=10,309)			
Cancer sites	N	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n	Sum	n bysites	% of sites	% of n
Bone	35	31	141	2.20	0.39	30	141	1.42	0.12	5	141	35	0.03	3	142	2.1	0.02	11	142	7.7	0.07	4	142	2.8	0.02	2	142	1.4	0.01	7	142	4.9	0.04	9	142	6.3	0.06	3	142	2.1	0.02	2	142	1.4	0.01	23	142	16.2	0.14
Bone marrow	214	194	496	39.1	3.20	179	497	36.0	1.11	69	497	13.9	0.43	37	497	7.4	0.23	68	496	13.7	0.42	46	496	9.3	0.29	71	496	14.3	0.44	61	496	12.3	0.38	84	496	16.9	0.52	57	495	11.5	0.36	46	494	9.3	0.29	102	494	20.6	0.63
Breast	1012	439	1,000	14.2	2.72	560	1005	1.82	3.47	219	1003	7.1	1.36	131	1000	4.2	0.81	179	1005	5.8	1.11	95	1006	3.1	0.59	126	1003	6.7	1.28	188	1006	9.3	1.79	151	1002	8.1	1.56	132	1008	5.0	0.95	120	1001	3.9	0.75	431	1079	34.0	2.88
CNS	191	62	558	1.11	0.38	135	560	2.41	0.84	70	560	12.5	0.43	39	562	3.4	0.21	45	561	8.0	0.28	21	560	4.1	0.14	47	561	8.4	0.29	55	561	9.8	0.34	58	561	10.3	0.36	32	560	3.9	0.14	47	561	8.4	0.29	71	562	12.6	0.44
Digestive	414	146	1,189	2.07	1.53	343	1193	2.88	2.33	137	1191	11.5	0.85	108	1191	10.7	0.79	108	1190	17.6	1.30	80	1190	6.7	0.50	104	1188	8.8	0.65	134	1188	10.4	0.77	171	1186	14.4	1.06	93	1189	8.0	0.58	120	1187	10.1	0.75	211	1187	17.8	1.31
GYN	268	146	629	2.32	0.91	198	630	3.14	1.23	68	630	10.8	0.42	47	630	10.6	0.42	98	630	15.7	0.61	43	630	6.8	0.27	68	629	10.8	0.42	83	629	13.2	0.51	89	628	14.2	0.55	38	627	6.1	0.24	66	628	10.5	0.41	128	629	20.3	0.79
Head&Neck	693	388	2,264	1.72	2.47	408	2,261	1.76	2.53	219	2,255	9.5	1.36	108	2,255	4.7	0.67	377	2,261	16.4	2.34	71	2,253	3.1	0.44	151	2,251	6.5	0.94	214	2,252	9.3	1.33	231	2,250	10.0	1.44	106	2,261	4.6	0.66	171	2,255	7.4	1.06	239	2,251	10.6	1.98
Lung	1067	450	2,880	1.59	1.79	684	2,881	2.42	4.24	340	2,875	11.7	2.23	164	2,881	5.8	1.02	331	2,879	11.8	2.07	184	2,875	13.6	2.38	211	2,877	7.5	1.31	302	2,876	10.7	1.87	334	2,872	11.5	2.01	165	2,918	5.9	1.03	154	2,873	9.0	1.58	495	2,879	17.1	3.01
Lymphnodes	104	52	233	2.44	0.32	63	233	2.66	0.39	31	234	14.5	0.19	11	234	5.1	0.07	26	234	12.1	0.16	15	232	7.1	0.09	24	233	11.3	0.15	33	233	15.5	0.20	31	233	14.6	0.19	18	234	8.8	0.11	16	233	7.5	0.10	36	233	16.9	0.22
Male genital	944	162	1,100	7.3	1.00	198	1094	1.08	1.48	111	1094	5.0	0.69	33	1096	1.5	0.20	70	1096	3.2	0.43	52	1094	2.3	0.31	67	1098	3.0	0.41	93	1096	4.2	0.58	105	1098	4.8	0.65	58	1098	2.6	0.36	90	1098	4.1	0.56	245	1095	11.1	1.52
Skin	391	136	964	1.31	0.78	150	965	1.55	0.93	69	965	7.2	0.43	30	966	3.1	0.19	74	964	7.7	0.46	40	963	4.2	0.25	94	965	5.6	0.34	91	966	7.5	0.45	76	964	7.9	0.47	34	957	3.6	0.21	57	964	5.9	0.35	107	966	11.1	0.66
Soft tissue	217	133	807	1.50	0.92	193	807	2.18	1.20	80	807	9.0	0.50	45	807	5.1	0.28	67	806	7.6	0.42	37	805	4.2	0.23	56	807	6.3	0.35	63	807	7.1	0.39	79	805	8.9	0.49	36	801	4.1	0.23	54	806	6.1	0.34	121	806	13.7	0.75
Throid and endocrine	80	34	241	1.41	0.21	62	241	1.57	0.38	37	241	11.2	0.17	23	241	9.5	0.14	38	241	15.8	0.24	11	238	4.6	0.07	30	240	12.5	0.19	43	239	17.6	0.26	48	239	20.1	0.30	19	240	7.9	0.12	23	240	9.6	0.14	35	240	14.6	0.22
Urinary tract	153	69	334	1.91	0.37	95	336	2.66	0.40	35	337	11.0	0.22	16	334	5.1	0.10	44	334	14.0	0.27	8	333	2.6	0.05	15	334	4.8	0.09	26	335	8.3	0.16	35	332	11.2	0.22	17	335	6.6	0.17	30	335	9.5	0.19	53	335	16.2	0.22
Unknown	15	12	42	2.86	0.07	26	42	6.19	0.16	16	42	38.1	0.10	3	42	7.1	0.02	18	42	42.9	0.11	7	42	16.7	0.04	6	42	14.3	0.04	6	41	14.6	0.04	13	40	32.5	0.08	5	40	12.5	0.03	3	41	7.3	0.02	14	41	34.1	0.09

The percentage (%) of severe symptoms (ESAS score > 7)



Sociodemographic differences

		N	Total		
	Gender (Severity analysis: Chi-sq, Sum score analysis: GLM)		Mean (Sum)	Avg # Severe Symptoms	
	Men	10382	22.56	1.05	
	Women	9271	26.92	1.43	
	p-value		**<0.0001**	**<0.0001**	
	Race (Sum score analysis: ANOVA)				
1	White	13592	24.32	1.93	**ANOVA of sum score = p <0.0001**
2	Black/AA	1337	27.69	2.47	Tukey's Contrasts:
3	Asian	337	19.86	1.78	**1 vs 2** **1 vs 6** **1 vs 7**
4	Hawaiian/Pacific Islander	20	28.15	1.55	**2 vs 3**
5	American Indian, Aleutian, or Eskimo	23	31.23	2.39	**3 vs 7**
6	More than 1 race	63	14.75	0.71	**5 vs 6**
7	Other race	931	26.59	2.30	**6 vs 7**
	Missing	350			
	Ethnicity (Severity analysis: Chi-sq, Sum score analysis: GLM)				
	not Hispanic/Latino	17473	24.52	1.21	
	Hispanic/Latino	1795	25.38	1.42	
	p-value		**0.12**	**<0.0001**	
	Missing	385			
	Marital Status (Sum score analysis: ANOVA)				
1	Married	11213	22.49	1.87	**ANOVA of sum score = p <0.0001**
2	Divorced	1775	28.96	2.18	Tukey's contrasts:
3	Domestic Partner	92	27.78	1.73	**1 vs 2** **1 vs 5**
4	Separated	84	28.77	2.32	**2 vs 6**
5	Single	2504	27.57	2.16	**5 vs 6**
6	Widowed	927	23.98	2.01	
	Missing	3058			
	Age (Severity analysis: Chi-sq, Sum score analysis: GLM)				
	<65	12150	26.54	1.35	
	65+	7503	21.46	1.04	
	p-value		**<0.0001**	**<0.0001**	

Advanced Statistical Analysis Practices-
1. Sociodemographic predictors

Original Article

A Longitudinal Analysis of Symptom Clusters in Cancer Patients and Their Sociodemographic Predictors

Bejoy C. Thomas, PhD, Amy Waller, PhD, Rebecca L. Malhi, PhD, Tak Fung, PhD, Linda E. Carlson, PhD, Shannon L. Groff, BSc, and Barry D. Bultz, PhD

- Panel regression

Table 6
Predictors of Distress From Panel Regression for All Patients ($N = 877$)

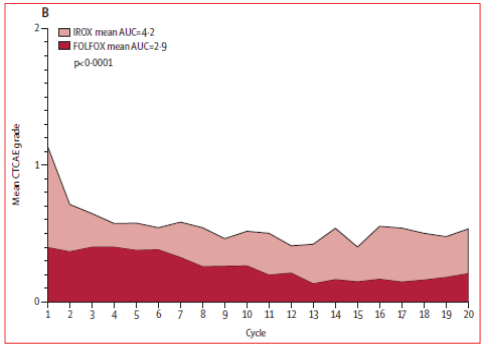
Variable	β	Wald χ^2	CI Lower	CI Upper	*P* Value
Age	0.000	0.007	−0.008	0.009	0.993
Gender	0.252	4.206	0.011	0.494	0.040
Living arrangements	−0.030	0.020	−0.448	0.387	0.886
Marital status	0.360	4.093	0.011	0.709	0.043
Income	−0.153	1.345	−0.412	0.106	0.246
Ethnicity		3.472			0.324
Canadian visible minorities	0.050	0.027	−0.548	0.648	0.870
Foreign-born whites	0.204	0.493	−0.366	0.775	0.483
Visible minorities	−0.456	2.823	−0.987	0.076	0.093
Radiation therapy	−0.133	0.413	−0.558	0.272	0.520
Surgery	0.555	12.464	0.247	0.863	<0.001
Chemotherapy	0.170	1.141	−0.142	0.482	0.285
Somatic cluster	0.699	112.578	0.570	0.828	<0.001
Psychological cluster	0.218	220.835	0.190	2.46	<0.001
Nutrition cluster	−0.279	29.576	−0.380	−0.179	<0.001

Advanced Statistical Analysis Practices-
2. The severity of symptoms over time

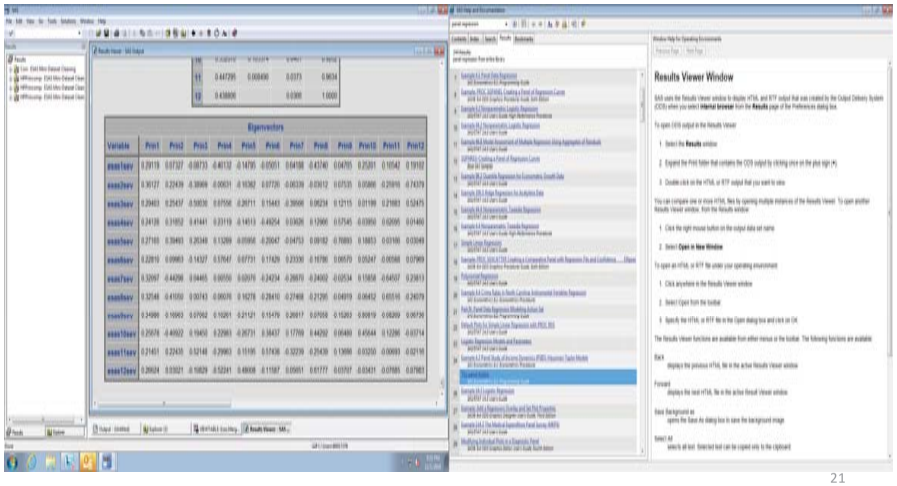
Longitudinal adverse event assessment in oncology clinical trials: the Toxicity over Time (ToxT) analysis of Alliance trials NCCTG N9741 and 979254

Gita Thanarajasingam, Pamela J Atherton, Paul J Novotny, Charles L Loprinzi, Jeff A Sloan, Axel Grothey

- Time-dependent AUC



Advanced Statistical Analysis Practice



Taipei ? Days Trips

Question?!

1. **How to make the best data sources?**
2. **How to make all information in a Table?**
3. **How to make a distinct Figure?**

2. How to make all information in a Table?

Presentation by sites and total

		Pain (n= 16128)					Tiredness (n=16128)					Drowiness (n=16122)					Nausea (n=16137)					Lack of appetite (n= 16111)					Shortness of breath (n=16109)				
Cancer sites	N	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n
Bone	35	31	141	22.0	0.19	20	141	14.2	0.12	5	141	3.5	0.03	3	142	2.1	0.02	11	142	7.7	0.07	4	142	2.8	0.02
Bone marrow	214	194	496	39.1	1.20	179	497	36.0	1.11	69	497	13.9	0.43	37	497	7.4	0.23	68	496	13.7	0.42	46	496	9.3	0.29
Breast	1012	439	3090	14.2	2.72	560	3085	18.2	3.47	219	3083	7.1	1.36	131	3089	4.2	0.81	179	3085	5.8	1.11	95	3086	3.1	0.59
CNS	191	62	558	11.1	0.38	135	560	24.1	0.84	70	560	12.5	0.43	19	562	3.4	0.12	45	561	8.0	0.28	23	560	4.1	0.14
Digestive	414	246	1189	20.7	1.53	343	1193	28.8	2.13	137	1191	11.5	0.85	128	1191	10.7	0.79	209	1190	17.6	1.30	80	1190	6.7	0.50
GYN	268	146	629	23.2	0.91	198	630	31.4	1.23	68	630	10.8	0.42	67	630	10.6	0.42	99	630	15.7	0.61	43	630	6.8	0.27
Head & Neck	693	398	2314	17.2	2.47	408	2313	17.6	2.53	219	2315	9.5	1.36	108	2315	4.7	0.67	377	2301	16.4	2.34	71	2313	3.1	0.44
Lung	1067	450	2830	15.9	2.79	684	2831	24.2	4.24	360	2825	12.7	2.23	164	2831	5.8	1.02	333	2829	11.8	2.07	384	2825	13.6	2.38
Lymph nodes	104	52	213	24.4	0.32	63	213	29.6	0.39	31	214	14.5	0.19	11	214	5.1	0.07	26	214	12.1	0.16	15	212	7.1	0.09
Male genital	944	162	2220	7.3	1.00	239	2214	10.8	1.48	111	2214	5.0	0.69	33	2216	1.5	0.20	70	2216	3.2	0.43	52	2214	2.3	0.32
Skin	391	126	964	13.1	0.78	150	965	15.5	0.93	69	965	7.2	0.43	30	966	3.1	0.19	74	964	7.7	0.46	40	963	4.2	0.25
Soft tissue	217	133	887	15.0	0.82	193	887	21.8	1.20	80	887	9.0	0.50	45	887	5.1	0.28	67	886	7.6	0.42	37	885	4.2	0.23
Throid and endocrine	80	34	241	14.1	0.21	62	241	25.7	0.38	27	241	11.2	0.17	23	241	9.5	0.14	38	241	15.8	0.24	11	238	4.6	0.07
Urinary tract	153	60	314	19.1	0.37	65	316	20.6	0.40	35	317	11.0	0.22	16	314	5.1	0.10	44	314	14.0	0.27	8	313	2.6	0.05
Unknown	15	12	42	28.6	0.07	26	42	61.9	0.16	16	42	38.1	0.10	3	42	7.1	0.02	18	42	42.9	0.11	7	42	16.7	0.04

		Depression (n= 16116)					Anxiety (n=16117)					Worst overall wellbeing (n=16087)					Worst spiritual wellbeing (n= 15982)					Constipation (n= 16098)					Difficulty sleeping (n=16109)				
Cancer sites	N	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n	Sum	n by sites	% of sites	% of n
Bone	35	2	142	1.4	0.01	7	142	4.9	0.04	9	142	6.3	0.06	3	142	2.1	0.02	2	142	1.4	0.01	23	142	16.2	0.14
Bone marrow	214	71	496	14.3	0.44	61	496	12.3	0.38	84	496	16.9	0.52	57	495	11.5	0.36	46	494	9.3	0.29	102	494	20.6	0.63
Breast	1012	206	3083	6.7	1.28	288	3086	9.3	1.79	251	3082	8.1	1.56	152	3068	5.0	0.95	120	3081	3.9	0.75	431	3079	14.0	2.68
CNS	191	47	561	8.4	0.29	55	561	9.8	0.34	58	561	10.3	0.36	22	560	3.9	0.14	47	561	8.4	0.29	71	562	12.6	0.44
Digestive	414	104	1188	8.8	0.65	124	1188	10.4	0.77	171	1184	14.4	1.06	93	1169	8.0	0.58	120	1187	10.1	0.75	211	1187	17.8	1.31
GYN	268	68	629	10.8	0.42	83	629	13.2	0.51	89	628	14.2	0.55	38	627	6.1	0.24	66	628	10.5	0.41	128	629	20.3	0.79
Head & Neck	693	151	2311	6.5	0.94	214	2312	9.3	1.33	231	2310	10.0	1.44	106	2301	4.6	0.66	171	2315	7.4	1.06	319	2311	13.8	1.98
Lung	1067	211	2827	7.5	1.31	302	2826	10.7	1.87	324	2822	11.5	2.01	165	2793	5.9	1.03	254	2823	9.0	1.58	485	2829	17.1	3.01
Lymph nodes	104	24	213	11.3	0.15	33	213	15.5	0.20	31	213	14.6	0.19	18	204	8.8	0.11	16	213	7.5	0.10	36	213	16.9	0.22
Male genital	944	67	2218	3.0	0.42	93	2216	4.2	0.58	105	2209	4.8	0.65	58	2190	2.6	0.36	90	2208	4.1	0.56	245	2215	11.1	1.52
Skin	391	54	965	5.6	0.34	72	966	7.5	0.45	76	964	7.9	0.47	34	957	3.6	0.21	57	964	5.9	0.35	107	966	11.1	0.66
Soft tissue	217	56	887	6.3	0.35	63	887	7.1	0.39	79	885	8.9	0.49	36	881	4.1	0.23	54	886	6.1	0.34	121	886	13.7	0.75
Throid and endocrine	80	30	240	12.5	0.19	42	239	17.6	0.26	48	239	20.1	0.30	19	240	7.9	0.12	23	240	9.6	0.14	35	240	14.6	0.22
Urinary tract	153	15	314	4.8	0.09	26	315	8.3	0.16	35	312	11.2	0.22	27	315	8.6	0.17	30	315	9.5	0.19	51	315	16.2	0.32
Unknown	15	6	42	14.3	0.04	6	41	14.6	0.04	13	40	32.5	0.08	5	40	12.5	0.03	3	41	7.3	0.02	14	41	34.1	0.09

Presentation by sites

Cancer sites	N	Pain (n= 16128) Sum	n by sites	% of sites	Tiredness (n= 16128) Sum	n by sites	% of sites	Drowiness (n= 16122) Sum	n by sites	% of sites	Nausea (n= 16137) Sum	n by sites	% of sites	Lack of appetite (n= 16111) Sum	n by sites	% of sites	Shortness of breath (n= 16109) Sum	n by sites	% of sites
Bone	35	31	141	22.0	20	141	14.2	5	141	3.5	3	142	2.1	11	142	7.7	4	142	2.8
Bone marrow	214	194	496	39.1	179	497	36.0	69	497	13.9	37	497	7.4	68	496	13.7	46	496	9.3
Breast	1012	439	3090	14.2	560	3085	18.2	219	3083	7.1	131	3089	4.2	179	3085	5.8	95	3086	3.1
CNS	191	62	558	11.1	135	560	24.1	70	560	12.5	19	562	3.4	45	561	8.0	23	560	4.1
Digestive	414	246	1189	20.7	343	1193	28.8	137	1191	11.5	128	1191	10.7	209	1190	17.6	80	1190	6.7
GYN	268	146	629	23.2	198	630	31.4	68	630	10.8	67	630	10.6	99	630	15.7	43	630	6.8
Head & Neck	693	398	2314	17.2	408	2313	17.6	219	2315	9.5	108	2315	4.7	377	2301	16.4	71	2313	3.1
Lung	1067	450	2830	15.9	684	2831	24.2	360	2825	12.7	164	2831	5.8	333	2829	11.8	384	2825	13.6
Lymph nodes	104	52	213	24.4	63	213	29.6	31	214	14.5	11	214	5.1	26	214	12.1	15	212	7.1
Male genital	944	162	2220	7.3	239	2214	10.8	111	2214	5.0	33	2216	1.5	70	2216	3.2	52	2214	2.3
Skin	391	126	964	13.1	150	965	15.5	69	965	7.2	30	966	3.1	74	964	7.7	40	963	4.2
Soft tissue	217	133	887	15.0	193	887	21.8	80	887	9.0	45	887	5.1	67	886	7.6	37	885	4.2
Throid and endocrine	80	34	241	14.1	62	241	25.7	27	241	11.2	23	241	9.5	38	241	15.8	11	238	4.6
Urinary tract	153	60	314	19.1	65	316	20.6	35	317	11.0	16	314	5.1	44	314	14.0	8	313	2.6
Unknown	15	12	42	28.6	26	42	61.9	16	42	38.1	3	42	7.1	18	42	42.9	7	42	16.7

Cancer sites	N	Depression (n= 16116) Sum	n by sites	% of sites	Anxiety (n= 16117) Sum	n by sites	% of sites	Worst overall wellbeing (n= 16087) Sum	n by sites	% of sites	Worst spiritual wellbeing (n= 15982) Sum	n by sites	% of sites	Constipation (n= 16098) Sum	n by sites	% of sites	Difficulty sleeping (n= 16109) Sum	n by sites	% of sites
Bone	35	2	142	1.4	7	142	4.9	9	142	6.3	3	142	2.1	2	142	1.4	23	142	16.2
Bone marrow	214	71	496	14.3	61	496	12.3	84	496	16.9	57	495	11.5	46	494	9.3	102	494	20.6
Breast	1012	206	3083	6.7	288	3086	9.3	251	3082	8.1	152	3068	5.0	120	3081	3.9	431	3079	14.0
CNS	191	47	561	8.4	55	561	9.8	58	561	10.3	22	560	3.9	47	561	8.4	71	562	12.6
Digestive	414	104	1188	8.8	124	1188	10.4	171	1184	14.4	93	1169	8.0	120	1187	10.1	211	1187	17.8
GYN	268	68	629	10.8	83	629	13.2	89	628	14.2	38	627	6.1	66	628	10.5	128	629	20.3
Head & Neck	693	151	2311	6.5	214	2312	9.3	231	2310	10.0	106	2301	4.6	171	2315	7.4	319	2311	13.8
Lung	1067	211	2827	7.5	302	2826	10.7	324	2822	11.5	165	2793	5.9	254	2823	9.0	485	2829	17.1
Lymph nodes	104	24	213	11.3	33	213	15.5	31	213	14.6	18	204	8.8	16	213	7.5	36	213	16.9
Male genital	944	67	2218	3.0	93	2216	4.2	105	2209	4.8	58	2190	2.6	90	2208	4.1	245	2215	11.1
Skin	391	54	965	5.6	72	966	7.5	76	964	7.9	34	957	3.6	57	964	5.9	107	966	11.1
Soft tissue	217	56	887	6.3	63	887	7.1	79	885	8.9	36	881	4.1	54	886	6.1	121	886	13.7
Throid and endocrine	80	30	240	12.5	42	239	17.6	48	239	20.1	19	240	7.9	23	240	9.6	35	240	14.6
Urinary tract	153	15	314	4.8	26	315	8.3	35	312	11.2	27	315	8.6	30	315	9.5	51	315	16.2
Unknown	15	6	42	14.3	6	41	14.6	13	40	32.5	5	40	12.5	3	41	7.3	14	41	34.1

Presentation by symptoms

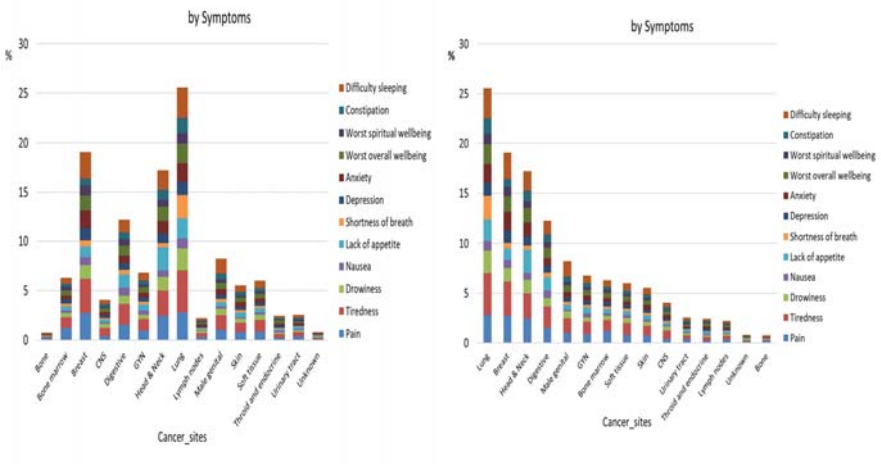
(response rate: 81.4 ~82.2%)

Cancer sites	N	Pain (n=16128) Sum	% of n	Tiredness (n=16128) Sum	% of n	Drowiness (n=16122) Sum	% of n	Nausea (n=16137) Sum	% of n	Lack of appetite (n=16111) Sum	% of n	Shortness of breath (n=16109) Sum	% of n
Bone	35	31	0.19	20	0.12	5	0.03	3	0.02	11	0.07	4	0.02
Bone marrow	214	194	1.20	179	1.11	69	0.43	37	0.23	68	0.42	46	0.29
Breast	1012	439	2.72	560	3.47	219	1.36	131	0.81	179	1.11	95	0.59
CNS	191	62	0.38	135	0.84	70	0.43	19	0.12	45	0.28	23	0.14
Digestive	414	246	1.53	343	2.13	137	0.85	128	0.79	209	1.30	80	0.50
GYN	268	146	0.91	198	1.23	68	0.42	67	0.42	99	0.61	43	0.27
Head & Neck	693	398	2.47	408	2.53	219	1.36	108	0.67	377	2.34	71	0.44
Lung	1067	450	2.79	684	4.24	360	2.23	164	1.02	333	2.07	384	2.38
Lymph nodes	104	52	0.32	63	0.39	31	0.19	11	0.07	26	0.16	15	0.09
Male genital	944	162	1.00	239	1.48	111	0.69	33	0.20	70	0.43	52	0.32
Skin	391	126	0.78	150	0.93	69	0.43	30	0.19	74	0.46	40	0.25
Soft tissue	217	133	0.82	193	1.20	80	0.50	45	0.28	67	0.42	37	0.23
Throid and endocrine	80	34	0.21	62	0.38	27	0.17	23	0.14	38	0.24	11	0.07
Urinary tract	153	60	0.37	65	0.40	35	0.22	16	0.10	44	0.27	8	0.05
Unknown	15	12	0.07	26	0.16	16	0.10	3	0.02	18	0.11	7	0.04

Cancer sites	N	Depression (n=16116) Sum	% of n	Anxiety (n=16117) Sum	% of n	Worst overall wellbeing (n=16087) Sum	% of n	Worst spiritual wellbeing (n=15982) Sum	% of n	Constipation (n= 16098) Sum	% of n	Difficulty sleeping (n=16109) Sum	% of n
Bone	35	2	0.01	7	0.04	9	0.06	3	0.02	2	0.01	23	0.14
Bone marrow	214	71	0.44	61	0.38	84	0.52	57	0.36	46	0.29	102	0.63
Breast	1012	206	1.28	288	1.79	251	1.56	152	0.95	120	0.75	431	2.68
CNS	191	47	0.29	55	0.34	58	0.36	22	0.14	47	0.29	71	0.44
Digestive	414	104	0.65	124	0.77	171	1.06	93	0.58	120	0.75	211	1.31
GYN	268	68	0.42	83	0.51	89	0.55	38	0.24	66	0.41	128	0.79
Head & Neck	693	151	0.94	214	1.33	231	1.44	106	0.66	171	1.06	319	1.98
Lung	1067	211	1.31	302	1.87	324	2.01	165	1.03	254	1.58	485	3.01
Lymph nodes	104	24	0.15	33	0.20	31	0.19	18	0.11	16	0.10	36	0.22
Male genital	944	67	0.42	93	0.58	105	0.65	58	0.36	90	0.56	245	1.52
Skin	391	54	0.34	72	0.45	76	0.47	34	0.21	57	0.35	107	0.66
Soft tissue	217	56	0.35	63	0.39	79	0.49	36	0.23	54	0.34	121	0.75
Throid and endocrine	80	30	0.19	42	0.26	48	0.30	19	0.12	23	0.14	35	0.22
Urinary tract	153	15	0.09	26	0.16	35	0.22	27	0.17	30	0.19	51	0.32
Unknown	15	6	0.04	6	0.04	13	0.08	5	0.03	3	0.02	14	0.09

3. How to make a distinct Figure?

How to make a distinct Figure?



Short Summary

Thanks for your attention!!

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Original article

Effects of the bass brushing method on dental plaque and pneumonia in older adults hospitalized with pneumonia after discharge: A randomized controlled trial

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ARTICLE INFO

Keywords:
Bass brushing method
Oral hygiene
Older adults
Dental plaque
Pneumonia

ABSTRACT

Aim: The purpose of this pilot study was to evaluate the effects of the Bass brushing method on dental plaque and pneumonia in older adults hospitalized with pneumonia after discharge.
Background: Poor oral hygiene may lead to pneumonia. Complications of pneumonia in older adults can be life-threatening during hospitalization and after discharge.
Methods: Older adults hospitalized with pneumonia (n = 30) were randomly assigned to intervention (with the Bass brushing method; n = 15) or control (with usual care; n = 15) groups. Dental plaque index and pneumonia as detected on chest x-rays were evaluated prior to the intervention (baseline) and every month for six months after discharge.
Results: Participants in the intervention group experienced a sustained reduction in dental plaque from the fourth to the sixth months (p = .024; p = .025; p = .000, respectively) that was not found in the control group. There were no group differences in detected pneumonia throughout the follow-up period. Pneumonia as detected on the chest x-rays at baseline (p = .001) and dental plaque index (p = .021) were significant predictors of the risk of pneumonia across groups.
Conclusions: The Bass brushing method is a simple and effective oral hygiene practice that reduces dental plaque in older adults hospitalized with pneumonia after discharge.

1. Introduction

Dental plaque and pneumonia are critical indicators of oral health in adults aged 65 years and older (Kassebaum et al., 2017; Müller, 2015). Poor oral hygiene can increase dental plaque, caries, and the severity of periodontitis, which may induce oral pathogenic microorganism-related respiratory tract infections such as pneumonia (Danckert, Ryan, Plummer, & Williams, 2016; Pace & McCullough, 2010; Peate & Gault, 2013). Pneumonia caused by inadequate oral care is especially problematic in institutionalized older adults (relative risk = 1.67, 95% confidence interval [CI]: 1.01–2.75) (Yoneyama et al., 2002), and is associated with increased medical costs (Rozenbaum, Mangen, Huijts, van der Werf, & Postma, 2015) and mortality (Sjögren, Wardh, Zimmerman, Almstahl, & Wikstrom, 2016). Repeated hospitalization due to pneumonia (Oda, 2017; Scannapieco, 2014) is a common occurrence in older adults who previously had pneumonia (Dang, Eurich, Weir, Marrie, & Majumdar, 2014), but data are sparse on approaches (e.g., toothbrushing method) to prevent the recurrence of pneumonia after patients are discharged (Sjögren, Nilsson, Forsell, Johansson, & Hoogstraate, 2008).

According to Mojon's (2002) proposed mechanism of oral health and respiratory infection, adequate oral hygiene can decrease the incidence of pneumonia (Müller, 2015) and improve quality of life in older adults (Bissett & Preshaw, 2011; Müller, Shimazaki, Kahabuka, & Schimmel, 2017). Among older adults, physical weakness, cognitive impairment, and psychosocial isolation can limit older adults' ability to practice good oral hygiene, and cause worsening pneumonia (Kandelman, Petersen, & Ueda, 2008; Oda, 2017). This is especially concerning given that fully symptomless or functional recovery from pneumonia can take three to six months (El Moussaoui et al., 2006; El Solh, Pineda, Bouquin, & Mankowski, 2006), and elderly patients with pneumonia are at a higher risk of mortality compared to their younger counterparts (Rozenbaum et al., 2015). In previous interventions, dental hygienists and caregivers have received instructions in how to clean older adults' teeth after every meal (Adachi, Ishihara, Abe, & Okuda, 2007; Adachi, Ishihara, Abe, Okuda, & Ishikawa, 2002; Yoneyama et al., 2002), but proper oral techniques are challenging to maintain for extended periods of time even after the provision of oral hygiene instructions (Weinstein, Milgrom, Melnick, Beach, & Spadafora, 1989). Therefore, an effective and easy-to-follow tooth brushing method is critical for older adults with pneumonia during and after hospitalization (Coker, Ploeg, Kaasalainen, & Carter, 2017; Forsell, Kullberg, Hoogstraate, Johansson, & Sjögren, 2011; Weening-Verbree, Huisman-de Waal, van Dusseldorp, van Achterberg, & Schoonhoven, 2013).

The purposes of this longitudinal study were to evaluate the effects of the Bass brushing method on dental plaque and pneumonia in older adults hospitalized with pneumonia from discharge through six months after discharge. The Bass brushing method has been shown to be an effective oral hygiene practice that removes dental plaque successfully (Graetz et al., 2012; Poyato-Ferrera, Segura-Egea, & Bullón-Fernández, 2003). We hypothesized that compared to usual care, older adults hospitalized with pneumonia who use the Bass brushing method would have less dental plaque and recurrent pneumonia.

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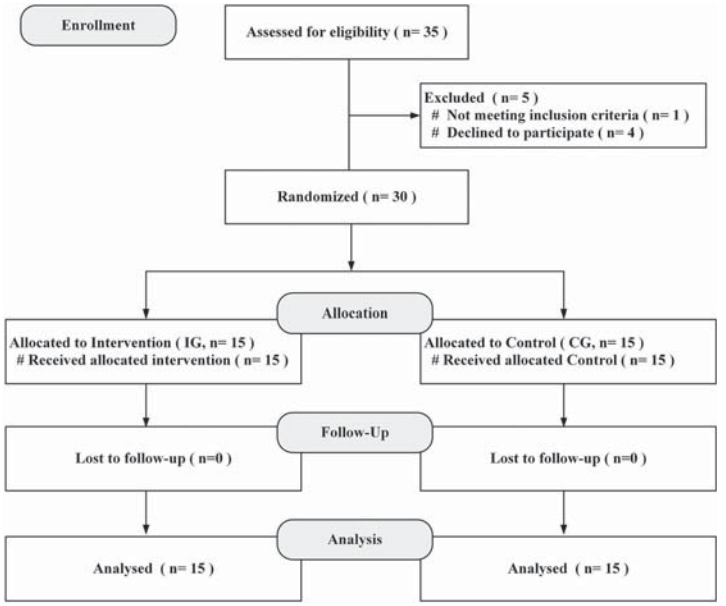

Fig. 1. Flowchart of the longitudinal randomized pilot study.

2. Methods

2.1. Study design

This study used a longitudinal randomized pilot design aimed at evaluating the effect of the Bass brushing method on dental plaque and pneumonia during the six month follow-up period after discharge. The study was approved by the Institutional Review Board of Taichung Veterans General Hospital (No. CF16095A).

2.2. Study setting and sample

Patients were recruited from a 35-bed geriatric ward in a medical center from June 1st, 2016 to May 31st, 2017. Patients were eligible if they: (1) were ≥65 years old, (2) were admitted with clinician-diagnosed pneumonia and in stable physical condition, (3) had at least one tooth, and (4) were able to provide consent and participate after verbal explanation. Patients were ineligible if they: (1) refused to participate in this study, (2) used an electric toothbrush, (3) were unconscious, (4) or had pneumonia with respiratory-related side-effects or symptoms, such as severe asthma or low oxygen saturation that necessitated using a ventilator.

It was determined that 18 participants would be needed to detect a medium effect (f = 0.25; α = 0.05; power = 0.80; groups = 2; repetitions = 7; correlation among repeated measures = 0.5; nonsphericity

Table 1
Participant characteristics (n = 30)

Variables	IG (n = 15)	CG (n = 15)	t	p
Age (years), Mean (SD)	82.3 (5.7)	84.5 (8.7)	0.824	0.417
Natural teeth, Mean (SD)	15.3 (9.3)	15.9 (8.4)	0.206	0.838

	n	(%)	n	(%)	χ^2	p
Sex[a]						1.000
Male	12	(80.0)	13	(86.7)		
Female	3	(20.0)	2	(13.3)		
Comorbidities						
1. COPD						1.000
Yes	7	(46.7)	7	(46.7)		
No	8	(53.3)	8	(53.3)		
2. DM[a]						1.000
Yes	3	(20.0)	3	(20.0)		
No	12	(80.0)	12	(80.0)		
3. Hypertension[a]						0.109
Yes	13	(86.7)	8	(53.3)		
No	2	(13.3)	7	(46.7)		
Previous pneumonia within 6 months					2.143	0.143
Yes	10	(66.7)	6	(40.0)		
No	5	(33.3)	9	(60.0)		
Dental clinic visit						0.136
within 6 months	4	(26.7)	8	(53.3)		
over 6 months ago	11	(73.3)	7	(46.7)		
Oral hygiene practice						
1. Brushing teeth after meals					0.000	1.000
Yes	9	(60.0)	9	(60.0)		
No	6	(40.0)	6	(40.0)		
2. Daily brushing times						0.713
Once	7	(46.7)	6	(40.0)		
at least two times	8	(53.3)	9	(60.0)		
3. Brushing duration						0.028*
≧3min	4	(26.7)	10	(66.7)		
< 3min	11	(73.3)	5	(33.3)		
4. Bass brushing method						
4–1 Placing bristles along the gumline at a 45° near the crown and brushing teeth from gumline to crown					0.536	0.464
Yes	6	(40.0)	8	(53.3)		
No	9	(60.0)	7	(46.7)		
4–2 Brushing teeth beginning at the right and ending at the right					0.600	0.439
Yes	9	(60.0)	11	(73.3)		
No	6	(40.0)	4	(26.7)		
4–3 Cleaning teeth from inside to outside and upper dentition to lower dentition.					2.143	0.143
Yes	6	(40.0)	10	(66.7)		
No	9	(60.0)	5	(33.3)		

Note. IG = intervention group; CG = control group; COPD = Chronic Obstructive Pulmonary Disease; DM = Diabetes mellitus.
[a] Fisher's test.
* $p < .05$.

correction epsilon = 1) with two equal groups and seven repetitions (calculated using G*Power version 3.1.9.2, EG Electronics). To account for participant attrition, the sample size was set at 30. Participants were randomized in equal numbers to the intervention (n = 15) and control groups (n = 15) by withdrawing computer randomized sampling numbers (using Microsoft Excel 2010) from concealed envelopes to determine their group status (Fig. 1.).

2.3. Intervention and measures

The Bass brushing method includes three procedures: (1) placing bristles along the gumline at a 45° near the crown and brushing teeth from gumline to crown; (2) brushing teeth beginning at the right and ending at the right; and (3) cleaning teeth from inside to outside and upper dentition to lower dentition (Graetz et al., 2012; Sato et al., 2008). Three nursing researchers were in charge of recruitment and instruction, and their consistency of the Bass brushing method was 90%. The intervention group received instructions for using the Bass brushing method and an oral health education leaflet about using a toothbrush and toothpaste at least once every day. The control group received the same oral health education leaflet, toothbrush, and toothpaste, but they brushed their teeth as usual and without individual guidance.

The following participant characteristics were collected at baseline: (a) demographics: age, sex, and number of natural teeth; (b) pneumonia-related: comorbidities and diagnosis of pneumonia within the previous six months; and (c) oral health-related: current periodontal disease, oral hygiene behaviors, and tooth brushing method.

The primary outcome was the dental plaque index. The Plaque Control Record (PCR) was used to record the presence of dental plaque on six surfaces of each stained tooth (O'Leary, Drake, & Naylor, 1972), and verified for accuracy by the senior dentist. The dental plaque index was defined as the number of plaque-containing surfaces divided by the total number of available surfaces.

The secondary outcome was pneumonia as detected on chest x-rays. Pneumonia manifested on the chest x-ray images with airspace opacity, lobar consolidation or interstitial opacities. If the chest x-ray image evidenced the above signs of pneumonia, patients were determined to have detected pneumonia. If there were no signs of pneumonia on the chest x-ray image, then the patients were determined to have undetected pneumonia. However, all patients were screened for clinical evidence of pneumonia and treated for symptoms of pneumonia, such as fever, cough, and shortness of breath (Long, Long, & Koyfman, 2017).

2.4. Data collection

All participants were evaluated seven times: at the beginning of the intervention in the hospital (baseline), and once a month for six months after discharge. At each assessment, participants gargled with a diluted 10 cc disclosing solution (9:1 water and 1.5% dental disclosing solution (GUM RED-COTE®, Sunstar Americas, Inc., Chicago, USA) for three minutes and a nurse researcher who was guided by a senior dentist assessed and calculated the dental plaque index. A senior chest medicine physician took responsibility for the outcome of the chest x-ray.

2.5. Statistical analysis

Descriptive statistics (means, standard deviations, frequency distribution, and percentages) were used to characterize participant characteristics, dental plaque index, and pneumonia as detected by chest x-rays. Chi-square tests and independent t-tests were used to examine differences in baseline attributes between groups. Variables significant at baseline ($p < .05$) were included as covariates in multivariate analyses. Generalized estimating equations (GEE) and generalized linear mixed models (GLMM) were used to analyze the effect of the Bass brushing method on dental plaque and pneumonia. Little's missing completely at random (MCAR) test was used to examine the type of missing data. Analyses were conducted using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., New York, NY, USA), and significance levels were set at α = 0.05.

3. Results

3.1. Participant characteristics

A total of 35 older adults hospitalized with pneumonia were approached for participation. One patient was younger than 65 years old, and four declined to participate in the study (Fig. 1). The final sample comprised 30 older adults hospitalized with pneumonia, and no participants dropped out of the study.

Participant characteristics are presented in Table 1. The mean age of participants in the intervention group and control group was 82.3 and 84.5 years, respectively. Patients were primarily male (80.0% in the intervention group and 86.7% in the control group). The mean number of natural teeth was 15.9 ± 8.4 in the intervention group and 15.3 ± 9.3 in the control group. An equal number of participants in each group had chronic obstructive pulmonary disorder (COPD) and diabetes mellitus (DM), but 86.7% of those in the intervention group had hypertension compared to 53.3% in the control group. A total of 66.7% and 40% of subjects in the intervention group and control group were diagnosed with pneumonia in the previous six months, respectively.

Regarding oral health-related attributes, 80% of participants suffered from periodontal disease and received regular dental check-ups, and 60% could brush their teeth after meals in both groups. For participants in the intervention group, 73.3% had not visited a dental clinic within the previous six months as compared to 46.7% in the control group, and 53.3% of participants in the intervention group brushed their teeth at least two times per day compared to 60.0% of participants in the control group. Participants in the intervention group were less likely to brush their teeth for at least 3 min compared to participants in the control group (26.7% vs. 66.7%).

3.2. Effect on dental plaque

Means and standard deviations for the dental plaque index are presented in Table 2 and displayed visually in Fig. 2. At baseline, there was no significant difference in dental plaque between the two groups (β = −0.124, p = .137), even after adjusting for brushing duration (β = −0.029, p = .671) in the GEE model (Table 3). For participants in the intervention group, dental plaque was significantly lower at four (β = −0.225, p = .024), five (β = −0.223, p = .025), and six months (β = −0.488, p = .000) after discharge when compared to baseline levels. For participants in the control group, dental plaque was significantly lower at one month (β = −0.180, p = .012) and three months (β = −0.167, p = .031) after discharge as compared to baseline. No participants reported adverse effects of the dental disclosing solution.

Table 2
Dental plaque index and pneumonia as detected on chest x-rays in older adults hospitalized with pneumonia after discharge (n = 30)

	IG (n=15)		CG (n=15)		ES (f)
	Mean	SD	Mean	SD	
Dental plaque index					
Baseline	48.0%	24.6%	59.2%	25.9%	0.216
1 Month	34.0%	27.8%	42.2%	30.8%	0.136
2 Months	32.2%	25.8%	54.6%	37.4%	0.260
3 Months	23.6%	22.7%	46.0%	28.6%	0.421
4 Months	28.4%	28.0%	60.1%	28.6%	0.562
5 Months	16.2%	8.8%	53.5%	18.1%	1.335
6 Months	12.9%	11.0%	72.9%	35.9%	1.127

	n	%	n	%	
Pneumonia as detected on chest x-rays					
Baseline	12	80.0	10	66.7	−0.143
1 Month	2	13.3	4	26.7	0.182
2 Months	2	13.3	3	20.0	0.093
3 Months	1	6.7	2	13.3	0.116
4 Months	2	13.3	1	6.7	−0.108
5 Months	2	13.3	1	6.7	−0.108
6 Months	1	6.7	1	6.7	0.000

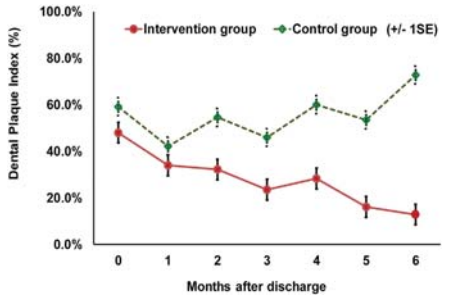

Fig. 2. Trend in dental plaque index in older adults hospitalized with pneumonia after discharge.
Note. 0 = baseline data.

Table 3
GEE analysis of the Bass brushing method on the dental plaque index in older adults hospitalized with pneumonia after discharge

Variables	β	SE	95% C.I.	p
(Intercept)	0.612	0.070	[0.475, 0.749]	.000***
Group effect	−0.124	0.083	[−0.287, 0.039]	.137
Time effect				
1 Month	−0.180	0.071	[−0.320, −0.040]	.012*
2 Months	−0.081	0.138	[−0.351, 0.190]	.558
3 Months	−0.167	0.077	[−0.318, −0.016]	.031*
4 Months	0.011	0.083	[−0.151, 0.172]	.899
5 Months	−0.059	0.077	[−0.210, 0.093]	.449
6 Months	0.174	0.112	[−0.044, 0.392]	.119
Group by time effect				
Intervention group × 1 Month	0.041	0.091	[−0.138, 0.220]	.656
Intervention group × 2 Months	−0.095	0.153	[−0.395, 0.206]	.537
Intervention group × 3 Months	−0.081	0.093	[−0.263, 0.101]	.382
Intervention group × 4 Months	−0.225	0.100	[−0.420, −0.030]	.024*
Intervention group × 5 Months	−0.223	0.099	[−0.418, −0.028]	.025*
Intervention group × 6 Months	−0.488	0.132	[−0.747, −0.229]	.000***
Brushing time (≧ 3 min/ < 3 min)	−0.029	0.069	[−0.165, 0.106]	.671

Note. × = interaction–related effects.
* $p < .05$.
*** $p < .001$.

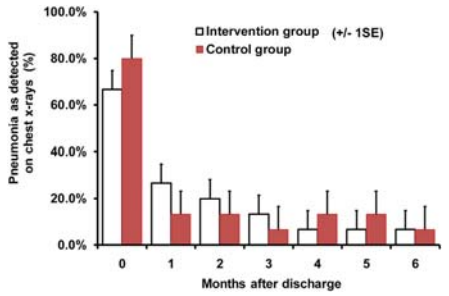

Fig. 3. Trend in pneumonia as detected on chest x-rays in older adults hospitalized with pneumonia after discharge.
Note. 0 = baseline data.

Table 4
GLMM analysis of the Bass brushing method on pneumonia as detected on chest x-rays for older adults hospitalized with pneumonia after discharge

Variables	β	SE	t	95% C. I.	*p*	Exp(B)
(Intercept)	−4.753	1.941	−2.448	[8.638, −0.870]	0.017*	0.009
Group effect	0.674	1.772	0.380	[−2.872, 4.219]	0.705	1.961
Pneumonia at baseline (detected/undetected)	5.765	1.707	3.377	[2.350, 9.180]	0.001***	318.862
Dental plaque index	4.363	1.843	2.368	[0.677, 8.049]	0.021*	78.515
Time effect						
1 Month	−2.578	1.677	−1.537	[−5.933, 0.777]	0.130	0.003
2 Months	−2.403	1.727	−1.392	[−5.857, 1.051]	0.169	0.090
3 Months	−4.201	1.961	−2.142	[−8.124, −0.278]	0.036*	0.015
4 Months	−4.334	2.074	−2.090	[−8.483, −0.186]	0.041*	0.013
5 Months	−3.631	2.033	−1.786	[−7.698, 0.435]	0.079	0.026
6 Months	−14.295	61.402	−0.233	[−137.117, 108.527]	0.817	0.000
Group by time effect						
Intervention group × 1 Month	−1.897	2.140	−0.887	[−6.178, 2.383]	0.379	0.150
Intervention group × 2 Months	−1.839	2.194	−0.838	[−6.227, 2.549]	0.405	0.159
Intervention group × 3 Months	1.373	2.680	0.512	[−3.988, 6.733]	0.610	3.946
Intervention group × 4 Months	2.425	2.709	0.895	[−2.995, 7.844]	0.374	11.297
Intervention group × 5 Months	0.912	2.508	0.364	[−4.106, 5.930]	0.717	2.490
Intervention group × 6 Months	10.994	61.448	0.179	[−111.920, 133.909]	0.859	59536.090

Note. × = interaction–related effects.
* $p < .05$.
*** $p < .001$.

3.3. Effect on pneumonia

Frequencies and percentages for pneumonia as detected on chest x-rays are presented in Table 2 and displayed visually in Fig. 3. From baseline to six months after discharge, the number of participants with detected pneumonia gradually decreased for both groups. Results from Little's MCAR test indicated that missing chest x-ray data were missing completely at random ($\chi^2 = 50.314$, df = 59, $p = .782$). Results from the GLMM model (Table 4) indicated no statistically significant difference between groups in pneumonia as detected on chest x-rays (β = 0.674, Exp [B] = 1.961; $p = .705$). Across groups, there was a significant reduction in the rates of pneumonia as detected on the chest x-rays at three months (β = − 4.201, Exp [B] = 0.015; $p = .036$) and four months (β = −4.334, Exp [B] = 0.013; $p = .041$) when compared to baseline. There were no significant changes over time in the intervention group, indicating that the Bass brushing method did not directly influence participants' pneumonia progression. However, pneumonia as detected on chest x-rays at baseline (β = 5.765, Exp [B] = 318.862; $p = .001$) and dental plaque (β = 4.363, Exp [B] = 78.515; $p = .021$) emerged as statistically significant predictors of the risk of pneumonia for both groups.

4. Discussion

Standard tooth brushing is a vital self-care practice that can improve oral health and may improve arm-joint motion and muscle strength (Inada et al., 2015). Low muscle strength and poor physical performance can impede the implementation of tooth brushing (Beenakker et al., 2010; Cruz-Jentoft et al., 2010), which is of particular concern among older patients who may lose considerable muscle strength within three days of going on bed rest or being hospitalized (Kortebein, Ferrando, Lombeida, Wolfe, & Evans, 2007). In this intervention, we aimed to evaluate the effects of the Bass brushing method on dental plaque and pneumonia in older adults after hospital discharge. Results from this study indicated that the Bass brushing method was effective at sustaining dental plaque removal over time. Consistent with existing literature, the Bass brushing method was also more effective at removing dental plaque than brushing duration (Graetz et al., 2012). However, at baseline, up to 60% of subjects in the intervention group were not able to implement the procedures of the Bass brushing method. Thus, participants may have understood the importance of brushing their teeth every day, but they may have had difficulty implementing the complete procedures of tooth brushing.

Results of this study indicated a clear relationship between dental plaque and the risk of pneumonia, consistent with existing literature (Sjögren et al., 2008), and confirmed the utility of the Bass brushing method as an evidence-based strategy for oral hygiene (Poyato-Ferrera et al., 2003). Participants in the intervention group were counseled about the severe consequences of pneumonia, which may have led to them to be more amenable to follow a standard tooth brushing method to maintain adequate oral health (Adachi et al., 2002; Ishikawa, Yoneyama, Hirota, Miyake, & Miyatake, 2008; Nishiyama, Inaba, Uematsu, & Senpuku, 2010; van der Maarel-Wierink, Vanobbergen, Bronkhorst, Schols, & de Baat, 2013). Considering the deconditioning cycle of pneumonia recovery, participants may have experienced difficulty in maintaining good oral hygiene during the critical recovery period between three and four months after discharge (El Moussaoui et al., 2006; El Solh et al., 2006). After this recovery period and through the sixth month after discharge, participants in the intervention group experienced significant sustained reductions in dental plaque compared to participants in the control group. This difference may be explained by better oral self-care habits facilitated by the intervention (Kakudate & Morita, 2012; Oda, 2017), and a stable physical condition. Future studies would benefit from a larger sample size, longer follow-up period, and an examination of discharged older adults' quality of life after receiving oral hygiene education. In addition, it would be worthwhile to apply evidence-based oral hygiene to other pneumonia-related populations, such as patients with lung cancer, who have been admitted to the ICU, or are under 65 years old.

Strengths of this study include examining patients over time after hospital discharge and employing a longitudinal randomized design with GEE and GLMM to examine the effects of the Bass brushing method on dental plaque and pneumonia. Limitations include patients not receiving regular chest x-rays after clinical examination, which resulted in missing data during the follow-up period. However, data missing completely at random in RCTs can be mitigated by using unweighted GEE and mixed models (Bell, Fiero, Horton, & Hsu, 2014).

5. Conclusion

In summary, our results suggest that the Bass brushing method is a useful oral hygiene practice for removing dental plaque in previously hospitalized older adults with pneumonia following hospital discharge. The dental plaque index can be used to monitor oral health and the risk of pneumonia in frail older adults after discharge. Care providers may also seek to provide older patients with reminders and encouragement to follow a standard tooth brushing method and undergo regular dental examinations after discharge.

Author's note

Authors' contributions

Ms. Ju and Ms. Chang made the concept and design of this study. Ms. Chung, Ms.Yang, and Ms. Huang were in charge of recruitment and education. Ms. Ju checked participants' oral health and calculated the DP-index after Dr. Huang' training and verification. Dr. Chin confirmed all chest x-ray images. Dr. Weng and Ms. Chang performed the data analysis and interpretation. Ms. Ju, Dr. Weng, Dr. Hoogland, and Ms. Chang drafted the manuscript and revised it critically for the important intellectual content.

Conflict of interests

The authors declare that there is no conflict of interest.

Acknowledgments

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ESAS SAS Syntax Homework -Pi-Hua Chang

```
TITLE 'ESAS Mini-Dataset Cleaning';
libname esas 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Datasets';

*Data cleaning syntax for the ESAS Mini Dataset, which merges the HRI information with ESAS assessments
     1.0  Import
     1.1  Remove duplicates
     1.2  Demographics
     1.3       Clinical characteristics
     1.4  ESAS Cleaning

*Initially created by Pi-Hua Chang;
*Checked/edited by Hailey Bulls 10-25-2018;

*1.0;
*Import Excel file - most recent provided from Zach 10-23-2018;
PROC IMPORT OUT= esas.Merged_import_10232018
          DATAFILE="N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Merged
Datasets\Merged_HRIESAS_mini_10232018.xlsx"
          DBMS=EXCEL REPLACE;
     GETNAMES=YES;
     MIXED=YES;
     SCANTEXT=YES;
     USEDATE=YES;
     SCANTIME=YES;
     run;

*Notes on merging/cleaning found here: N:\DATA\Users\Trainee\Bulls\ESAS\Merged Datasets\ESAS Data Merging
Notes
     Zach's code performs the following basic cleaning:
          Deletes ESAS assessments missing MRN, DATE, or both
          Removes duplicates from the scanned surveys (prior to timepstamped electronic records ) removed
(N=748)
          Removes HRI information missing tumor sequence number
          Removed patients aged < 18 years old
          Transposes clinical HRI data (up to seven diagnoses)
          Merges ESAS data with transposed HRI sociodemographics, then clinical characteristics data
          Removes patients with ESAS data before a diagnosis
          Final N from this dataset = 19670 observations from 5798 patients, 147 variables.;


* Original notes from Pi-Hua:
     Data cleaning and create dummy variables at 2018/10/15:
     Delete primary_site missing value and age_at_presentation younger than 18
     Resort orders: (1) mrn (2) date (3) age_at_presentation/descending
     Dummy date_of_diagnosis to date_diagnosis and translate to date formate because the original
date_of_diagnosis is a character formate
     Delete date missing value, date_of_diagnosis later than date, date dupliacte;
*Updates from Hailey, 10-25-2018:
     Reordered/organized syntax (see notes)
     Removed duplicate cleaning from Zach's import;

*1.1 Removing duplicates;
data esas.Merged_hriesas_mini_10302018; *Create work file from imported dataset;
set esas.Merged_import_10232018; *Imported dataset;
Length agegrp65_name Gender_status_Name Ethnicity_Name Race_Name Marital_status_Name ESAS_ICD
Esas_pStage_Name ESAS_Site_Name ESAS_Status_Name ESAS_status $ 60; *Creates length for new variables;

*Deleted duplicates identified from the scan forms who were identical on date, MRN, and summary score, but
slipped through
automated checking because of slight differences in spelling or punctuation;
*Also deleted duplicates Pi-Hua identified (5) and timestamped cases within a few minutes of each other
likely due to tech glitch (5);
*26 total removed;
if mrn = 2XXXX6  & esas_obs_num =  6   then delete;
if mrn = 5XXXX9  & esas_obs_num =  3   then delete; * Pi-Hua add;
if mrn = 6XXXX7  & esas_obs_num =  7   then delete;
if mrn = 6XXXX0  & esas_obs_num =  2   then delete;
if mrn = 6XXXX2  & esas_obs_num =  3   then delete;
if mrn = 7XXXX2  & esas_obs_num =  8   then delete; * Pi-Hua add;
if mrn = 7XXXX1  & esas_obs_num =  3   then delete;
if mrn = 7XXXX6  & esas_obs_num =  2   then delete;
if mrn = 7XXXX8  & esas_obs_num =  3   then delete;
```



```
if mrn = 7XXXX9  & esas_obs_num =  4   then delete;
if mrn = 7XXXX6  & esas_obs_num =  4   then delete;
if mrn = 7XXXX1  & esas_obs_num =  3   then delete;
if mrn = 7XXXX5  & esas_obs_num = 10   then delete; * Pi-Hua add;
if mrn = 7XXXX9  & esas_obs_num =  2   then delete; * Pi-Hua add;
if mrn = 7XXXX3  & esas_obs_num =  6   then delete; * Pi-Hua add;
if mrn = 7XXXX3  & esas_obs_num =  6   then delete;
if mrn = 7XXXX4  & esas_obs_num =  8   then delete; * Pi-Hua add;
if mrn = 7XXXX5  & esas_obs_num = 10   then delete; * Pi-Hua add;
if mrn = 7XXXX5  & esas_obs_num =  3   then delete; * Pi-Hua add;
if mrn = 7XXXX6  & esas_obs_num =  4   then delete;
if mrn = 7XXXX2  & esas_obs_num =  3   then delete; * Pi-Hua add;
if mrn = 7XXXX2  & esas_obs_num =  4   then delete;
if mrn = 7XXXX9  & esas_obs_num =  5   then delete;
if mrn = 7XXXX6  & esas_obs_num =  2   then delete;
if mrn = 7XXX16  & esas_obs_num =  7   then delete; * Pi-Hua add;
if mrn = 4XXXX5  & esas_obs_num =  1   then delete; * Pi-Hua find from daysbetweenDxandESAS and add becasue
'date' is pt's birthday;


*1.2 Demographic cleaning & recoding;

*Creates baseline age groups from first recoded age at diagnosis;
ESAS_age = (date - date_of_birth)/365 ;
if ESAS_age = .   then do agegrp65_name = 'Missing'   ; agegrp65 = .; END;
if ESAS_age ge 65 then do agegrp65_name = ' Age >= 65'; agegrp65 = 1; END;
if ESAS_age lt 65 then do agegrp65_name = ' Age <  65'; agegrp65 = 0; END;

*Creates gender variable from characters with 0 = female, 1 = male code;
IF gender_derived = 'MALE'    Then Do Gender_status_Name = 'Male';   Gender_status = 1; END;
IF gender_derived = 'FEMALE'  Then Do Gender_status_Name = 'Female'; Gender_status = 0; END;

*Creates ethnicity variable from characters;
Ethnicity = .;
IF ethnicity_derived = 'DEFAULT CODE' |
   ethnicity_derived = 'Unknown' |
   ethnicity_derived = ' ' |
   ethnicity_derived = '.' |
   ethnicity_derived = 'NA'  Then Do Ethnicity_Name = 'Missing';               Ethnicity_Code = .; END;
IF ethnicity_derived = 'Hispanic/Latino'         Then Do Ethnicity_Name = 'Hispanic/Latino';
Ethnicity_Code = 1; END;
IF ethnicity_derived = 'Non-Hispanic/Non-Latino'  Then Do Ethnicity_Name = 'Non-Hispanic/Non-Latino';
Ethnicity_Code = 0; END;

*Creates race variable from characters;
IF race_derived = 'DEFAULT CODE' |
   race_derived = 'Unknown' |
   race_derived= ' ' |
   race_derived= 'NA'                                        Then Do Race_Name = 'Missing';
Race_Code = .; END;
IF race_derived = 'White'                                     Then Do Race_Name = 'White';
Race_Code = 1; END;
IF race_derived = 'Black /African American'                      Then Do Race_Name = 'Black /African
American';                Race_Code = 2; END;
IF race_derived = 'Asian'                                     Then Do Race_Name = 'Asian';
Race_Code = 3; END;
IF race_derived = 'Native Hawaiian or Other Pacific Islander'       Then Do Race_Name = 'Native Hawaiian or
Other Pacific Islander'; Race_Code = 4; END;
IF race_derived = 'American Indian, Aleutian, or Eskimo'           Then Do Race_Name = 'American Indian,
Aleutian, or Eskimo';     Race_Code = 5; END;
IF race_derived = 'More than 1 race'                           Then Do Race_Name = 'More than 1 race';
Race_Code = 6; END;
IF race_derived = 'Other race, specify (is there a text response?)'  Then Do Race_Name = 'Other race';
Race_Code = 7; END;

*Creates marital status variable from characters (at first assessment);
IF marital_status_at_diagnosis_1 = 'UNKNOWN' | ESAS_Marital_status= ' ' | ESAS_Marital_status= 'NA' Then Do
Marital_status_Name = 'Unknow';         Marital_status_Code = .; END;
IF marital_status_at_diagnosis_1 = 'MARRIED'                                                  Then Do
Marital_status_Name = 'Married';        Marital_status_Code = 1; END;
IF marital_status_at_diagnosis_1 = 'DIVORCED'                                                 Then Do
Marital_status_Name = 'Divorced';       Marital_status_Code = 2; END;
IF marital_status_at_diagnosis_1 = 'DOMESTIC PARTNER'                                          Then Do
Marital_status_Name = 'Domestic Partner'; Marital_status_Code = 3; END;
IF marital_status_at_diagnosis_1 = 'SEPARATED'                                                Then Do
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Marital_status_Name = 'Separated';       Marital_status_Code = 4; END;
IF marital_status_at_diagnosis_1 = 'SINGLE'                                    Then Do
Marital_status_Name = 'Single';          Marital_status_Code = 5; END;
IF marital_status_at_diagnosis_1 = 'WIDOWED'                                   Then Do
Marital_status_Name = 'Widowed';         Marital_status_Code = 6; END;


*1.3 Clinical characteristics cleaning & recoding;

*Remove if diagnosis site is missing;
IF esas_site=' ' Then delete;

*Creates ESAS-relevant diagnosis site name and code;
*ESAS-relevant ICD codes not created by R syntax, so HWB created 10-25-2018;
*Recodes primary site as a character variable;
primarysite_char_1 = input(primary_site_code_1, $4.);
primarysite_char_2 = input(primary_site_code_2, $4.);
primarysite_char_3 = input(primary_site_code_3, $4.);
primarysite_char_4 = input(primary_site_code_4, $4.);
primarysite_char_5 = input(primary_site_code_5, $4.);
primarysite_char_6 = input(primary_site_code_6, $4.);
primarysite_char_7 = input(primary_site_code_7, $4.);

*Creates ESAS-relevant ICD code;
ESAS_ICD = .;
if esasdiagnosisnumber = 1 then ESAS_ICD = primarysite_char_1;
if esasdiagnosisnumber = 2 then ESAS_ICD = primarysite_char_2;
if esasdiagnosisnumber = 3 then ESAS_ICD = primarysite_char_3;
if esasdiagnosisnumber = 4 then ESAS_ICD = primarysite_char_4;
if esasdiagnosisnumber = 5 then ESAS_ICD = primarysite_char_5;
if esasdiagnosisnumber = 6 then ESAS_ICD = primarysite_char_6;
if esasdiagnosisnumber = 7 then ESAS_ICD = primarysite_char_7;

*Renamed Pi-Hua's variables to be descriptive (site1 = ESAS_Site_Name, site2 = ESAS_Site_Code);
ICD = substr (ESAS_ICD, 2, 2); *Specifies two digits from the second position of ESAS_ICD;
IF 00<=ICD<=14      Then DO ESAS_Site_Name='Head & Neck';         ESAS_Site_Code=1; END; /*dummy variables;
IF A Then Do B and C; add 'END;' */
IF 15<=ICD<=26      Then DO ESAS_Site_Name='Digestive';           ESAS_Site_Code=2; END;
IF 30<=ICD<=39      Then DO ESAS_Site_Name='Lung';                     ESAS_Site_Code=3; END;
IF ICD=40 or ICD=41 Then DO ESAS_Site_Name='Bone';                     ESAS_Site_Code=4; END;
IF ICD=42           Then DO ESAS_Site_Name='Bone marrow';         ESAS_Site_Code=5; END;
IF ICD=43 or ICD=44 Then DO ESAS_Site_Name='Skin';                     ESAS_Site_Code=6; END;
IF 45<=ICD<=49      Then DO ESAS_Site_Name='Soft tissue';         ESAS_Site_Code=7; END;
IF ICD=50           Then DO ESAS_Site_Name='Breast';              ESAS_Site_Code=8; END;
IF 51<=ICD<=58      Then DO ESAS_Site_Name='GYN';                 ESAS_Site_Code=9; END;
IF 60<=ICD<=63      Then DO ESAS_Site_Name='Male genital';        ESAS_Site_Code=10; END;
IF 64<=ICD<=68      Then DO ESAS_Site_Name='Urinary tract';       ESAS_Site_Code=11; END;
IF 69<=ICD<=72      Then DO ESAS_Site_Name='CNS';                 ESAS_Site_Code=12; END;
IF 73<=ICD<=75      Then DO ESAS_Site_Name='Throid and endocrine'; ESAS_Site_Code=13; END;
IF ICD=77           Then DO ESAS_Site_Name='Lymph nodes';         ESAS_Site_Code=14; END;
IF ICD=80           Then DO ESAS_Site_Name='Unknown';             ESAS_Site_Code=15; END;

*Creates ESAS-relevant cancer stage variable;
ESAS_Stage=ESAS_ClinicalStage; *Specifies first digit of clinical stage code;
IF ESAS_ClinicalStage=' ' | ESAS_ClinicalStage='.' Then ESAS_Stage=.; *. = missing;

ESAS_pStage = substr (ESAS_pathstage, 1, 1); *Specifies first digit of ESAS_pathstage; * Pi-Hua add;
IF ESAS_pStage = '0'  Then Do Esas_pStage_Name = 'In Situ';   Esas_pStage_Code =  0; pathstage = 1; END;
IF ESAS_pStage = '1'  Then Do Esas_pStage_Name = 'I';        Esas_pStage_Code =  1; pathstage = 1; END;
IF ESAS_pStage = '2'  Then Do Esas_pStage_Name = 'II';       Esas_pStage_Code =  2; pathstage = 1; END;
IF ESAS_pStage = '3'  Then Do Esas_pStage_Name = 'III';      Esas_pStage_Code =  3; pathstage = 1; END;
IF ESAS_pStage = '4'  Then Do Esas_pStage_Name = 'IV';       Esas_pStage_Code =  4; pathstage = 1; END;
IF ESAS_pStage = '9'  Then Do Esas_pStage_Name = 'Non_Stage'; Esas_pStage_Code =  5; pathstage = 0; END; *
Pi-Hua add 99 = unknown;
IF ESAS_pStage = 'N'  Then Do Esas_pStage_Name = 'Missing';   Esas_pStage_Code =  .; pathstage = .; END; *
Pi-Hua add . = missing;

*Creates ESAS-relevant cancer status variable;
*ESAS-relevant cancer status codes not created by R syntax, so HWB created 10-25-2018;
*Recodes cancer status as a character variable;

*Create status variable name and code;
primarystatus_char_1 = input(cancer_status_1, $25.);
primarystatus_char_2 = input(cancer_status_2, $25.);
primarystatus_char_3 = input(cancer_status_3, $25.);
```



```
primarystatus_char_4 = input(cancer_status_4, $25.);
primarystatus_char_5 = input(cancer_status_5, $25.);
primarystatus_char_6 = input(cancer_status_6, $25.);
primarystatus_char_7 = input(cancer_status_7, $25.);

*Creates ESAS-relevant status code;
IF esasdiagnosisnumber = 1   Then ESAS_status = primarystatus_char_1;
IF esasdiagnosisnumber = 2   Then ESAS_status = primarystatus_char_2;
IF esasdiagnosisnumber = 3   Then ESAS_status = primarystatus_char_3;
IF esasdiagnosisnumber = 4   Then ESAS_status = primarystatus_char_4;
IF esasdiagnosisnumber = 5   Then ESAS_status = primarystatus_char_5;
IF esasdiagnosisnumber = 6   Then ESAS_status = primarystatus_char_6;
IF esasdiagnosisnumber = 7   Then ESAS_status = primarystatus_char_7;

*Create status variable name and code;
IF ESAS_status = 'NA' | ESAS_status = ' ' | ESAS_status = '.' Then Do ESAS_Status_Name = 'Missing';
ESAS_Status_Code =  .;  castatus = . ; END;
IF ESAS_status = 'NOT FREE THIS TUMOR'                    Then Do ESAS_Status_Name = 'Not free this tumor';
ESAS_Status_Code =  0;  castatus = 0 ; END;
If ESAS_status = 'FREE (NED)'                             Then Do ESAS_Status_Name = 'Free (NED)';
ESAS_Status_Code =  1;  castatus = 1 ; END;
IF ESAS_status = 'UNKNOWN TUMOR STATUS'                   Then Do ESAS_Status_Name = 'Unknow';
ESAS_Status_Code = 99;  castatus = . ; END;


*Create vital status code;
vital = .;
if vital_status='Alive' then vital=1;
if vital_status='Dead' then vital=0;

*Create ESAS_diag_days code for diagnosis duration;
ESAS_diag_days = daysbetweenDxandESAS;
ESAS_diag_months = daysbetweenDxandESAS/30;


*1.4 ESAS Cleaning;

*Recode ESAS13 to be numeric;
esas13_rec = esas13;
if esas13='NA' then esas13_rec='';
esas13_num = input(esas13_rec, 1.);

*If ESAS Score is out of range (not between 0-10), then missing;
IF esas1<0 or esas1>10 or esas1= . then esas1 = .;
IF esas2<0 or esas2>10 or esas2= . then esas2 = .;
IF esas3<0 or esas3>10 or esas3= . then esas3 = .;
IF esas4<0 or esas4>10 or esas4= . then esas4 = .;
IF esas5<0 or esas5>10 or esas5= . then esas5 = .;
IF esas6<0 or esas6>10 or esas6= . then esas6 = .;
IF esas7<0 or esas7>10 or esas7= . then esas7 = .;
IF esas8<0 or esas8>10 or esas8= . then esas8 = .;
IF esas9<0 or esas9>10 or esas9= . then esas9 = .;
IF esas10<0 or esas10>10 or esas10= . then esas10 = .;
IF esas11<0 or esas11>10 or esas11= . then esas11 = .;
IF esas12<0 or esas12>10 or esas12= . then esas12 = .;
IF esas13_num<0 or esas13_num>10 or esas13_num= . then esas13_num = .;

esas13_forsum = esas13_num;
if esas13_num=. then esas13_forsum = 0;
sumscore_corrected = sum (esas1, esas2, esas3, esas4, esas5, esas6, esas7 ,esas8, esas9, esas10,
esas11,esas12);
*sumscore_corrected = esas1+esas2+esas3+esas4+esas5+esas6+esas7+esas8+esas9+esas10+esas11+esas12:
 "+": can't exclude and calculate the missing;


*Create coding scheme where each symptom is coded as severe if ge 7;
*IF symptom is out of range or missing, then severity is missing;
*IF symptom is between 0-6, then severity = 0;
*IF symptom is 7 or greater, then severity = 1;
IF esas1<0 or esas1>10 or esas1= . Then esas1sev= . ; ELSE IF 0<=esas1<7 Then esas1sev=0; Else esas1sev=1;
IF esas2<0 or esas2>10 or esas2= . Then esas2sev= . ; ELSE IF 0<=esas2<7 Then esas2sev=0; Else esas2sev=1;
IF esas3<0 or esas3>10 or esas3= . Then esas3sev= . ; ELSE IF 0<=esas3<7 Then esas3sev=0; Else esas3sev=1;
IF esas4<0 or esas4>10 or esas4= . Then esas4sev= . ; ELSE IF 0<=esas4<7 Then esas4sev=0; Else esas4sev=1;
IF esas5<0 or esas5>10 or esas5= . Then esas5sev= . ; ELSE IF 0<=esas5<7 Then esas5sev=0; Else esas5sev=1;
IF esas6<0 or esas6>10 or esas6= . Then esas6sev= . ; ELSE IF 0<=esas6<7 Then esas6sev=0; Else esas6sev=1;
```

```
IF esas7<0 or esas7>10 or esas7= . Then esas7sev= . ; ELSE IF 0<=esas7<7 Then esas7sev=0; Else esas7sev=1;
IF esas8<0 or esas8>10 or esas8= . Then esas8sev= . ; ELSE IF 0<=esas8<7 Then esas8sev=0; Else esas8sev=1;
IF esas9<0 or esas9>10 or esas9= . Then esas9sev= . ; ELSE IF 0<=esas9<7 Then esas9sev=0; Else esas9sev=1;
IF esas10<0 or esas10>10 or esas10= . Then esas10sev= . ; ELSE IF 0<=esas10<7 Then esas10sev=0; Else
esas10sev=1;
IF esas11<0 or esas11>10 or esas11= . Then esas11sev= . ; ELSE IF 0<=esas11<7 Then esas11sev=0; Else
esas11sev=1;
IF esas12<0 or esas12>10 or esas12= . Then esas12sev= . ; ELSE IF 0<=esas12<7 Then esas12sev=0; Else
esas12sev=1;

*Total number of severe symptoms > 7 (range 0-12);
severe_total = sum (esas1sev, esas2sev, esas3sev, esas4sev, esas5sev, esas6sev, esas7sev, esas8sev,
esas9sev, esas10sev, esas11sev, esas12sev); /* check esas1_1-esas12_1 missing value */
IF severe_total=' ' | severe_total= '.' then delete; *Removes anyone with all missing ESAS scores?;

run;


*If you want to check contents;
PROC contents DATA= esas.Merged_hriesas_mini_10302018;
RUN;

ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\stage
problem, 12-28-2018.pdf';
PROC Freq data = esas.Merged_hriesas_mini_10302018;
tables ESAS_pStage * ESAS_Stage;
RUN;
ods pdf close;


*****************************************************************************;

ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Data
distribution, 12-19-2018.pdf';
*Checking these new variables - gender, esas severity, site code, stage code, status code;
proc freq data=esas.Merged_hriesas_mini_10302018;
tables  esas_obs_num agegrp65_name agegrp65 Gender_status_Name Gender_status Ethnicity_Name Race_Name
Ethnicity_Code Race_Code Marital_status_Name Marital_status_Code
          esas1sev esas2sev esas3sev esas4sev esas5sev esas6sev esas7sev esas8sev esas9sev esas10sev
esas11sev esas12sev sumscore_corrected severe_total
          ESAS_Site_Name ESAS_Site_Code Esas_pStage_Name ESAS_pStage_Code pathstage ESAS_Status_Name
ESAS_Status_Code castatus vital / missing;
RUN;
PROC MEANS data = esas.Merged_hriesas_mini_10302018;
var ESAS_age ESAS_diag_months sumscore_corrected severe_total ;
RUN;
ods pdf close;


ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis &
Syntax\pStage_cStage_A, 12-28-2018.pdf';
*Checking these new variables - gender, esas severity, site code, stage code, status code;
data esas.Merged_hriesas_mini_cases;
set esas.Merged_hriesas_mini_10302018;
ESAS_cStage  = '.' ;
IF ESAS_pStage = '0'  Then ESAS_cStage = 0 ;
IF ESAS_pStage = '1'  Then ESAS_cStage = 1 ;
IF ESAS_pStage = '2'  Then ESAS_cStage = 2 ;
IF ESAS_pStage = '3'  Then ESAS_cStage = 3 ;
IF ESAS_pStage = '4'  Then ESAS_cStage = 4 ;
IF ESAS_pStage = '9' &  ESAS_Stage = 0 Then ESAS_cStage = 0 ;
IF ESAS_pStage = '9' &  ESAS_Stage = 1 Then ESAS_cStage = 1 ;
IF ESAS_pStage = '9' &  ESAS_Stage = 2 Then ESAS_cStage = 2 ;
IF ESAS_pStage = '9' &  ESAS_Stage = 3 Then ESAS_cStage = 3 ;
IF ESAS_pStage = '9' &  ESAS_Stage = 4 Then ESAS_cStage = 4 ;
IF ESAS_pStage = 'N' &  ESAS_Stage = . Then ESAS_cStage = . ;
RUN;
PROC SORT data=esas.Merged_hriesas_mini_cases NODUPKEY;
by mrn;
RUN;
PROC Freq data = esas.Merged_hriesas_mini_cases;
tables ESAS_pStage * ESAS_cStage ESAS_cStage;
RUN;
ods pdf close;
```



```
ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Demographics
& Clinical Characteristics, 12-19-2018.pdf';
*Checking these new variables - gender, esas severity, site code, stage code, status code;
data esas.Merged_hriesas_mini_cases;
set esas.Merged_hriesas_mini_10302018;
RUN;
PROC SORT data=esas.Merged_hriesas_mini_cases NODUPKEY;
by mrn;
RUN;
proc freq data=esas.Merged_hriesas_mini_cases;
tables  agegrp65_name agegrp65 Gender_status_Name Gender_status Ethnicity_Name Race_Name Ethnicity_Code
Race_Code Marital_status_Name Marital_status_Code
          esas1sev esas2sev esas3sev esas4sev esas5sev esas6sev esas7sev esas8sev esas9sev esas10sev
esas11sev esas12sev severe_total
          ESAS_Site_Name ESAS_Site_Code Esas_pStage_Name ESAS_pStage_Code pathstage ESAS_Status_Name
ESAS_Status_Code castatus vital / missing;
          run;
PROC MEANS data = esas.Merged_hriesas_mini_cases;
var ESAS_age ESAS_diag_months sumscore_corrected severe_total;
RUN;
ods pdf close;


*****************************************************************************
*Macros;

*Added 11-20-2018;
*Find first & maximum by patient;
*Analyze sociodemographic predictors of symptom burden by patient;
*Accounting for clinical variables;

libname esas 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Datasets';
data esas.Merged_hriesas_mini_11202018;
set esas.Merged_hriesas_mini_10302018;

*Testing macros building to scan the ESAS within patient and identify first & highest ESAS symptom score;

*Code;
%macro first (new, symptom); *code for macro, name of the macro, (placeholders for referencing variables
that change);
data esas.Merged_hriesas_mini_11202018; *choose dataset;
set esas.Merged_hriesas_mini_11202018;

&new. = .; *placeholder for esas1_obs1;
     if esas_obs_num = 1 then &new. = &symptom.;
     run; quit;
%mend first; *referencing the macro, pull it all together;
%first (esas1_obs1, esas1); *identifying variables for "first";
%first (esas2_obs1, esas2);
%first (esas3_obs1, esas3);
%first (esas4_obs1, esas4);
%first (esas5_obs1, esas5);
%first (esas6_obs1, esas6);
%first (esas7_obs1, esas7);
%first (esas8_obs1, esas8);
%first (esas9_obs1, esas9);
%first (esas10_obs1, esas10);
%first (esas11_obs1, esas11);
%first (esas12_obs1, esas12);
%first (sum_obs1, sumscore_corrected);

*Check to make sure it worked;
proc print data=esas.Merged_hriesas_mini_11202018 (obs=10) ;
     id mrn ;
     var esas_obs_num  sum_obs1 sumscore_corrected;
run;

*Max symptom burden;
* Obtain maximum;
     *IF maximum is on more than one date, choose the earliest one;
* Code maximum as new variable = 1;
* In future analyses, can constrain dataset to highest ESAS symptom at the earliest timepoint;

*Code;
```

```
%macro max (new, symptom, maxval); *code for macro, name of the macro, (placeholders for referencing
variables that change);
proc sort data=esas.Merged_hriesas_mini_11202018;
     by mrn &symptom. descending date;
     run;

data esas.Merged_hriesas_mini_11202018;
set esas.Merged_hriesas_mini_11202018;
by mrn &symptom. descending date; *sort data by MRN, then symptom score, then inverts the date to put the
earliest one last;
     &new. = last.mrn; *identifies esas_max as the last observation within the MRN group;

&maxval. = .;
     if &new. = 1 then &maxval. = &symptom.;
     run;
run;
quit;

%mend max; *referencing the macro, pull it all together;
%max (esas1_max, esas1, esas1_max_val); *identifying variables for "max";
%max (esas2_max, esas2, esas2_max_val);
%max (esas3_max, esas3, esas3_max_val);
%max (esas4_max, esas4, esas4_max_val);
%max (esas5_max, esas5, esas5_max_val);
%max (esas6_max, esas6, esas6_max_val);
%max (esas7_max, esas7, esas7_max_val);
%max (esas8_max, esas8, esas8_max_val);
%max (esas9_max, esas9, esas9_max_val);
%max (esas10_max, esas10, esas10_max_val);
%max (esas11_max, esas11, esas11_max_val);
%max (esas12_max, esas12, esas12_max_val);
%max (sum_max, sumscore_corrected, sum_max_val);


*Check to make sure it worked;
proc print data=esas.Merged_hriesas_mini_11202018;
     id mrn;
     var mrn date sum_max sum_max_val sumscore_corrected;
     where mrn = 106182;
     run;


*After discussion with Pi-Hua and Heather on 11/19/2018, Pi-Hua is interested in # of symptoms >7;
     *Create variable to evaluate the max # of symptoms >7;
     *As before, if maximum is on more than one date, choose the earliest one;
     *No need for a macro for this, as we're only interested in the sum score;
* Code severe_max as new variable = 1;
     *Then create new variable - severe_maxvalue - to reflect the actual number;
* In future analyses, can constrain dataset to highest ESAS symptom at the earliest timepoint;

*Code;
proc sort data=esas.Merged_hriesas_mini_11202018;
     by mrn severe_total descending date;
     run;

data esas.Merged_hriesas_mini_11202018;
set esas.Merged_hriesas_mini_11202018;
by mrn severe_total descending date; *sort data by MRN, then severe_total score, then inverts the date to
put the earliest one last;
     severe_max = last.mrn; *identifies severe_total as the last observation within the MRN group;
run;

data esas.Merged_hriesas_mini_11202018;
set esas.Merged_hriesas_mini_11202018;
severe_max_val = .;
     if severe_max = 1 then severe_max_val = severe_total;
     run;

*Check to make sure it worked;
proc print data=esas.Merged_hriesas_mini_11202018;
     id mrn;
     var mrn date severe_total severe_max_val severe_max;
     run;
```



```
proc freq data=esas.Merged_hriesas_mini_11202018;
tables  agegrp65_name agegrp65 Gender_status_Name Gender_status Ethnicity_Name Race_Name Ethnicity_Code
Race_Code Marital_status_Name Marital_status_Code
         esas1sev esas2sev esas3sev esas4sev esas5sev esas6sev esas7sev esas8sev esas9sev esas10sev
esas11sev esas12sev severe_total
         ESAS_Site_Name ESAS_Site_Code Esas_pStage_Name ESAS_pStage_Code pathstage ESAS_Status_Name
ESAS_Status_Code castatus vital / missing;
          run;
PROC MEANS data = esas.Merged_hriesas_mini_11202018;
var ESAS_age ESAS_diag_months sumscore_corrected severe_total;
RUN;



*************************************************************************************************
*12-07-2018;
*Analysis 1.2;
     *Categorical analyses;
     *For variables with ONLY two levels;
ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\ESAS_severe_group, 12-19-2018.pdf';
data esas.PiHua_11122018;
set esas.Merged_hriesas_mini_11202018;
RUN;
%macro groups (group);
proc sort data=esas.PiHua_11122018;
by &group.;
run;

proc means;
var severe_max_val;
by &group.;
where &group. ne .;
run;

proc glm plots=none;
CLASS &group.;
  MODEL severe_max_val = &group. ;
    means &group.;
      where &group. ne .;
  RUN; quit;

%mend groups;
%groups (agegrp65);
%groups (Gender_status);
%groups (Ethnicity_Code);
%groups (pathstage);
%groups (castatus);
*%groups (Pi-Hua - two category variable here);
ods pdf close;


*For variables with 3 or more levels;
ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\multgroup, 12-19-2018.pdf';
%macro multgroups (multgroup);
proc sort data=esas.PiHua_11122018;
by &multgroup.;
run;

proc means;
var severe_max_val;
by &multgroup.;
where &multgroup. ne .;
run;

proc glm plots=none;
CLASS &multgroup.;
  MODEL severe_max_val = &multgroup. ;
    means &multgroup. / tukey;
      where &multgroup. ne .;
  RUN; quit;

%mend multgroup;
%multgroups (Marital_Status_Code);
```

```
%multgroups (Race_Code);
%multgroups (ESAS_Site_Code);
%multgroups (pathstage);

*%multgroups (Pi-Hua - three or more categories variable here);

*Try making a macro;
%macro means (means);
proc sort data=esas.PiHua_11122018;
by &means.;
run;

proc means;
var severe_max_val;
by &multgroup.;
where &multgroup. ne .;
run;

proc glm plots=none;
CLASS &multgroup.;
  MODEL severe_max_val = &multgroup. ;
    means &multgroup. / tukey;
      where &multgroup. ne .;
  RUN; quit;

%mend multgroup;


ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\median, 12-17-2018.pdf';
* 'severe_max_val * agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code
ESAS_pStage_code ESAS_Status_Code';
proc sort data=esas.PiHua_11122018;
by agegrp65 gender_status;
run;

proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
by agegrp65 gender_status;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class Gender_status;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class Ethnicity_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class Race_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class Marital_status_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class ESAS_Site_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class ESAS_pStage_code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class ESAS_pStage_code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var severe_max_val;
class ESAS_Status_Code;
run;

* 'sum_max_val * agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code
ESAS_pStage_code ESAS_Status_Code';
```



```
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class agegrp65;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class Gender_status;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class Ethnicity_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class Race_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class Marital_status_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class ESAS_Site_Code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class ESAS_pStage_code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class ESAS_pStage_code;
run;
proc means data=esas.PiHua_11122018 n mean STDDEV min max median Q1 Q3;
var sum_max_val;
class ESAS_Status_Code;
run;
ods pdf close;

ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\median_q1_q3, 12-17-2018.pdf';
PROC Tabulate data=esas.PiHua_11122018;
class agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code ESAS_pStage_code
ESAS_Status_Code;
var sum_max_val;
table agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code ESAS_pStage_code
ESAS_Status_Code, (n mean STDDEV min max median q1 q3)*sum_max_val;
run;
PROC Tabulate data=esas.PiHua_11122018;
class agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code ESAS_pStage_code
ESAS_Status_Code;
var severe_max_val;
table agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code ESAS_pStage_code
ESAS_Status_Code, (n mean STDDEV min max median q1 q3)*severe_max_val;
run;
ods pdf close;


ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\GLM_severe_max_value, 12-19-2018.pdf';
PROC GLM data=esas.PiHua_11122018 plots=none;
Class agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code pathstage
castatus ;
MODEL severe_max_val = agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code pathstage
castatus;
Means agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code pathstage
castatus ;
Means Race_Code Marital_status_Code ESAS_Site_Code pathstage / tukey ;
RUN;
ods pdf close;


*************************************************************************************************
* Analysis 1.3;
* 12-12-2018 Pi-Hua practice to add;
* Categorical analyses;
```

```
* For variables with ONLY two levels;
ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\ESAS_burden group, 12-12-2018.pdf';
data esas.PiHua_11122018;
set esas.Merged_hriesas_mini_11202018;
RUN;
%macro groups (group);
proc sort data=esas.PiHua_11122018;
by &group.;
run;

proc means;
var sum_max_val;
by &group.;
where &group. ne .;
run;

proc glm plots=none;
CLASS &group.;
  MODEL sum_max_val = &group. ;
    means &group.;
      where &group. ne .;
  RUN; quit;

%mend groups;
%groups (agegrp65);
%groups (Gender_status);
%groups (Ethnicity_Code);
%groups (pathstage);
%groups (castatus);
*%groups (Pi-Hua - two category variable here);
ods pdf close;


*For variables with 3 or more levels;
ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\ESAS_burden multgroup, 12-12-2018A.pdf';
%macro multgroups (multgroup);
proc sort data=esas.PiHua_11122018;
by &multgroup.;
run;

proc means ;
var sum_max_val;
by &multgroup.;
where &multgroup. ne .;
run;

proc glm plots=none;
CLASS &multgroup.;
  MODEL sum_max_val = &multgroup. ;
    means &multgroup. / tukey;
      where &multgroup. ne .;
  RUN; quit;

%mend multgroup;
%multgroups (Marital_Status_Code);
%multgroups (Race_Code);
%multgroups (ESAS_Site_Code);
%multgroups (pathstage);

*%multgroups (Pi-Hua - three or more categories variable here);

ods pdf file = 'N:\DATA\Users\Trainee\Bulls\ESAS\Datasets, Analysis & Syntax\Analysis & Syntax\Pi-Hua
2018\SAS_output\GLM_sum_max_value, 12-19-2018.pdf';
PROC GLM data=esas.PiHua_11122018 plots=none;
Class agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code pathstage
castatus ;
MODEL sum_max_val = agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code
pathstage castatus;
Means agegrp65 Gender_status Ethnicity_Code Race_Code Marital_status_Code ESAS_Site_Code pathstage
castatus;
Means Race_Code Marital_status_Code ESAS_Site_Code pathstage / tukey ;
RUN;
ods pdf close;
```

CERTIFICATE OF ATTENDANCE
HEALTH OUTCOMES & BEHAVIOR PROGRAM

is presented to

Pi-Hua Chang

ACADEMIC VISITOR & SCHOLAR PROGRAM
H. Lee Moffitt Cancer Center & Research Institute
Tampa, Florida, U.S.A.

August 1, 2018 to January 24, 2019

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A National Cancer Institute
Comprehensive Cancer Center

Heather S. L. Jim, Ph.D.
Associate Member
Health Outcomes & Behavior

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CHECKLIST

Evaluating Oncology Clinical Pathways Programs

Clinical pathways are detailed, evidence-based treatment protocols that delineate optimal treatment options for cancer patients and may include recommended dosing, time frames, and sequencing of therapies. Payers, healthcare systems, and providers are increasingly adopting these treatment management tools, but how can your oncology practice know if a specific clinical pathway program is developed and implemented in a way that will ensure high-quality cancer care for your patients?

The questions below serve as a guide to examine a clinical pathway program your practice may currently be using or a clinical pathway that you may be considering for future use. Use the following checklist to help determine if an oncology clinical pathway program **meets, partially meets,** or **doesn't meet** criteria developed by the American Society of Clinical Oncology (ASCO) for a high-quality oncology pathway program, which focuses on three key areas: development, implementation/use, and analytics.[1]

ONCOLOGY CLINICAL PATHWAY: DEVELOPMENT

Is it expert driven? Did practicing oncology providers with relevant disease and/or specialty expertise play a central role in the pathway development?

Does it reflect stakeholder input? Was there a mechanism in place for patients, payers, and other stakeholders to provide input during the development process?

Is it transparent? Was there a clear, consistent process and methodology for pathway development that is transparent to all pathway users, stakeholders, and the general public? Is there a policy in place and adhered to that requires public disclosure of all potential conflicts of interest by oncology pathway panel members and any other individual or entities that contributed to the development of pathway content?

Is it evidence-based? Is the clinical pathway based on the best available scientific evidence documented or disseminated in clinical practice guidelines, peer-reviewed journals, and/or other disseminated vehicles? Is a mechanism in place for considering high-quality evidence generated from validated real-world data?

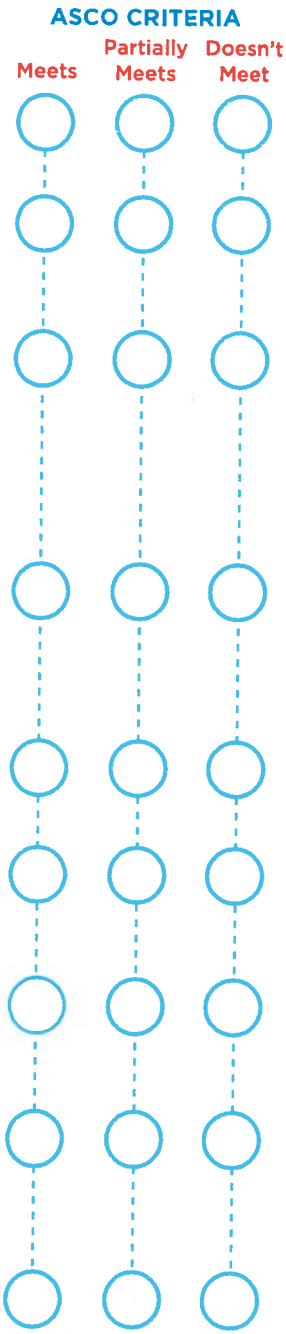
Is it patient focused? Does the pathway include evidence-based options to account for differences in patient characteristics and/or preferences?

Is it clinically driven? Is there an established methodology for prioritizing efficacy, safety, and cost? How is cost factored into pathway recommendations of therapeutically similar or equivalent treatments?

Is it timely? Is the pathway program updated as relevant new information becomes available? Is a full review of the pathway performed and documented at least annually, and does a mechanism exist for ongoing rapid evaluation?

Is it comprehensive? Does the pathway address the full spectrum of cancer care from diagnostic evaluation through first course of therapy, supportive care, post-treatment surveillance, to end-of-life care? If not, are the phase and elements of care the pathway is intended to address clearly described?

Does it promote participation in clinical trials? Are available clinical trials options incorporated into the pathway program?



[1]DOI: 10.1200/JOP.2016.019836. Journal of Oncology Practice 13, no. 3 (March 2017) 207-210.

ASCO
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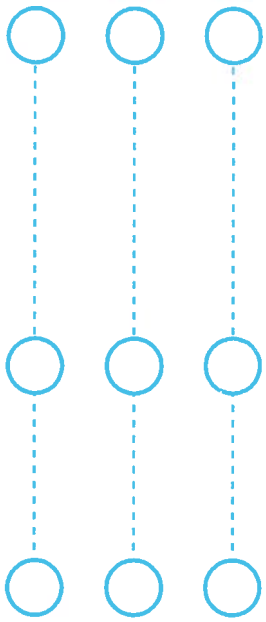
MAKING A WORLD OF DIFFERENCE IN CANCER CARE

CHECKLIST: Evaluating Oncology Clinical Pathways Programs

ONCOLOGY CLINICAL PATHWAY: IMPLEMENTATION AND USE

ASCO CRITERIA

Meets | Partially Meets | Doesn't Meet



Does the pathway program have clear and achievable expected outcomes? Is information provided on the specific cancer type, stage, and molecular profile that the pathway is intended to cover? Is there clear information provided to pathway users and other stakeholders on what constitutes treatment on the pathway, treatment off the pathway, and warranted variation from pathways recommendations? Do adherence rates allow for evidence-based variation and take into account individual patient differences and the resources available in the particular healthcare system or setting to provide recommended care?

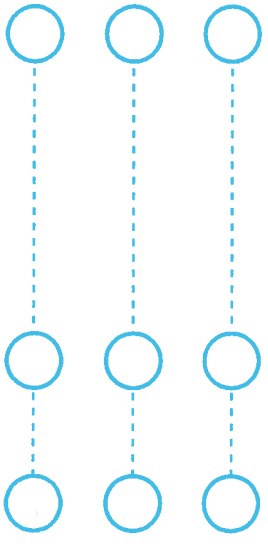
Does the pathway program have integrated, cost-effective technology and decision support? Does the pathway program comply with current federal mandates for meaningful use of electronic health record (EHR) technology or other requirements? Does the pathway program offer – or plan to offer – clinical decision support or other resources in a way that is integrated into commonly used EHRs?

Does the pathway program have efficient processes for communication adjudication? Does the pathway program provide references or links to references that may support pathway variation? Does it inform the provider in real time of pathway compliance? Is the mechanism for choosing an off-pathway recommendation and documenting the rationale for this choice easily imbedded in the pathway program?

ONCOLOGY CLINICAL PATHWAY: ANALYTICS

ASCO CRITERIA

Meets | Partially Meets | Doesn't Meet



Does the pathway program provide efficient and public reporting of performance metrics? Are regular reports provided to participating providers that demonstrate the level of current pathway performance and performance over time with comparisons to the performance of other groups of providers? Is there a mechanism in place for the provider to record reasons for going off-pathway? Will public reporting of providers' pathway adherence be disclosed as a composite report only? Do providers have an opportunity to review performance reports and revise any areas in need of adjustments?

Does the pathway program have outcomes-driven results? Does the pathway program have analytics in place to enable a movement over time from adherence-driven compliance to outcome-driven results?

Does the pathway program promote research and continuous quality improvement? Does the pathway program demonstrate a commitment to research aimed at assessing and improving the impact of pathways on patient and provider-patient experience, clinical outcomes, and value? Are patient assessment and pathway analysis used for pathway revision? Are the analytics generated from pathway programs publically available to patients and/or participating providers for benchmarking and understanding of complex cancer outcomes?

For more oncology pathways resources, visit asco.org/pathways.

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附錄七

Radiation Oncology Clinic Questionnaire

Dear Patient,

In order to better meet your needs, the Radiation Oncology Team would like to ask you about common symptoms experienced by patients. We would appreciate if you could take the time to answer the following questions.

Please complete the following questions **about how you feel NOW**; with "0" meaning that the symptom is absent and "10" that it is the worst possible severity. For the last choice of "other", please add any symptom that is bothering you but is not listed.

Edmonton Symptom Assessment Scale Please circle the number that best describes how you feel **NOW:**												
No Pain	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Pain
No Tiredness *(Tiredness = lack of energy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Tiredness *(Tiredness = lack of energy)*
No Drowsiness *(Drowsiness = feeling sleepy)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Drowsiness *(Drowsiness = feeling sleepy)*
No Nausea	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Nausea
No Lack of Appetite	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Lack of Appetite
No Shortness of Breath	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Shortness of Breath
No Depression *(Depression = feeling sad)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Depression *(Depression = feeling sad)*
No Anxiety *(Anxiety = feeling nervous)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Anxiety *(Anxiety = feeling nervous)*
Best Overall Wellbeing *(Wellbeing = how you feel overall)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Wellbeing *(Wellbeing = how you feel overall)*
Best Spiritual Wellbeing *(Spiritual Wellbeing = how you feel spiritually)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Spiritual Wellbeing *(Spiritual Wellbeing = how you feel spiritually)*
No Constipation	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Constipation
No Difficulty Sleeping	0	1	2	3	4	5	6	7	8	9	10	Worst Possible Difficulty Sleeping
No _____ other problem *(for example: itchiness)*	0	1	2	3	4	5	6	7	8	9	10	Worst Possible _____

Adapted from: The Edmonton symptom assessment system (ESAS) J Palliat Care. 1991

Signature of Patient or Legal Representative_____ Date _____

Signature of Person Completing Form (if not patient) _____Relationship to Patient _____

MOFFITT CANCER CENTER

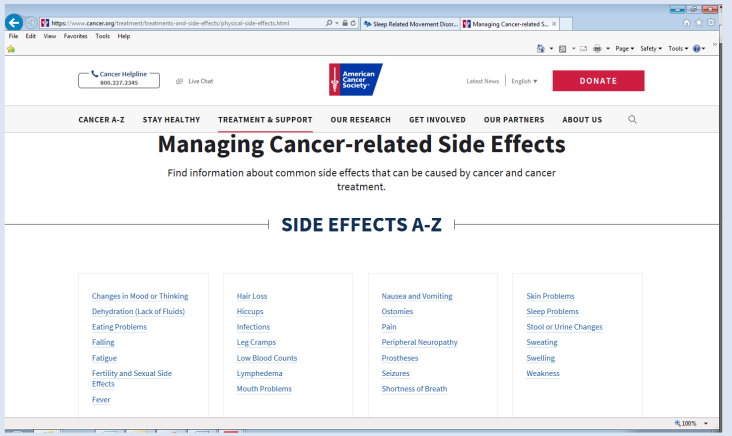
06/15

EMR: Radiation Oncology Patient Questionnaire
White-Chart Yellow – Clinic Manager

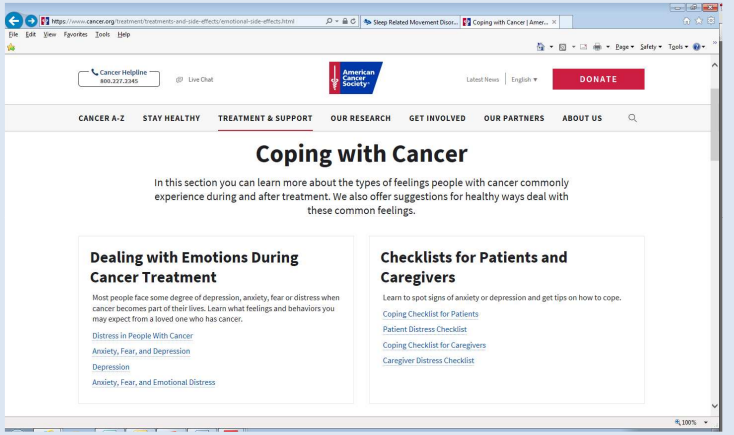
Patient Name:_____
Medical Record:_____
Date of Birth:_____

The ESAS-guided clinical pathway with physical and psychological problems and related managements

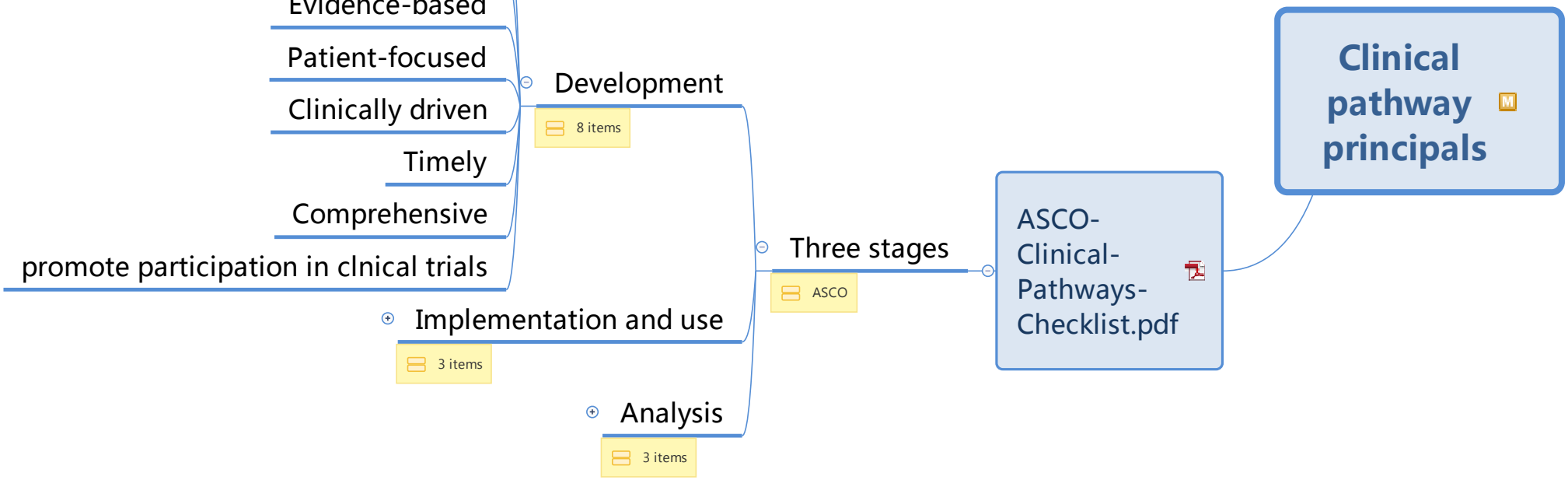
- theoretical background
- Clinical pathway principals

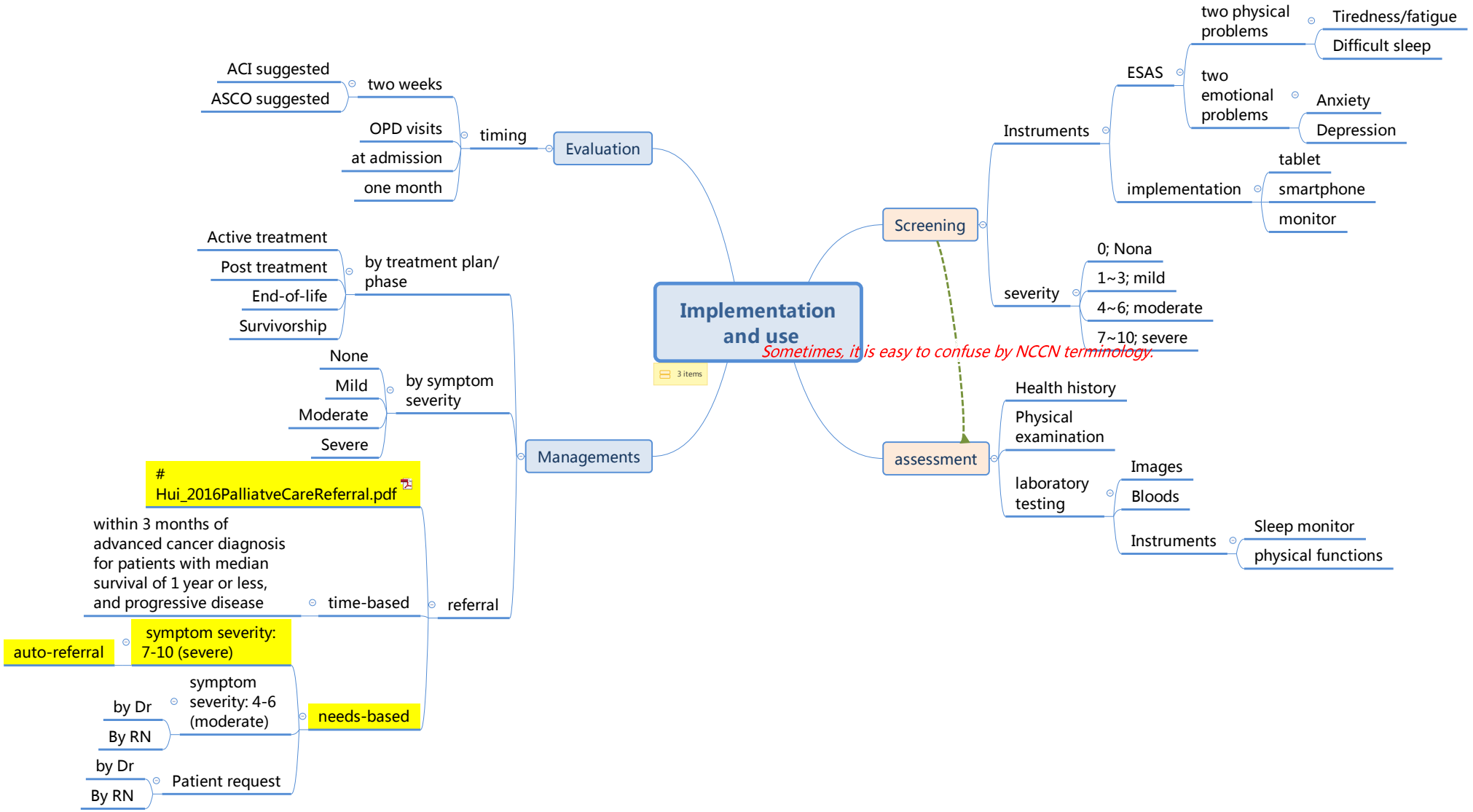


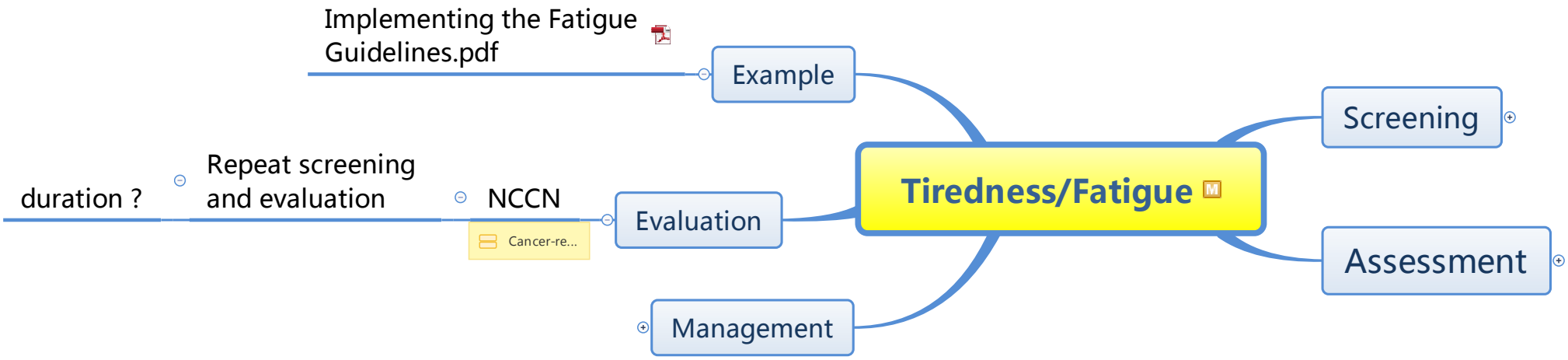
Two side-effects (ACS; NCI)

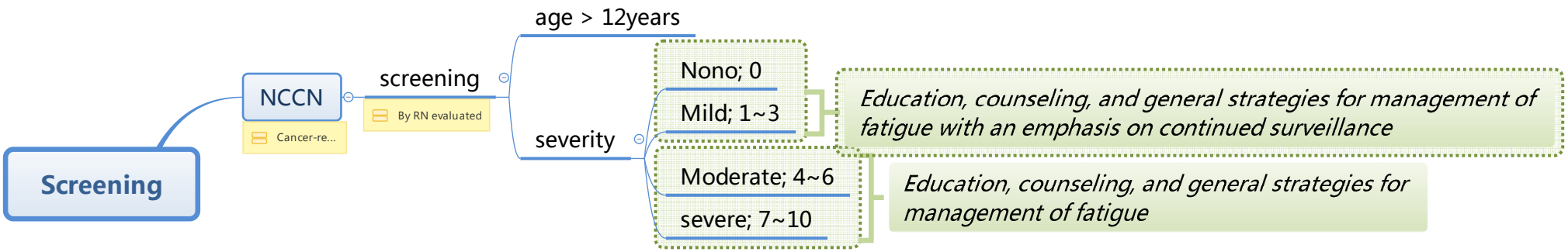


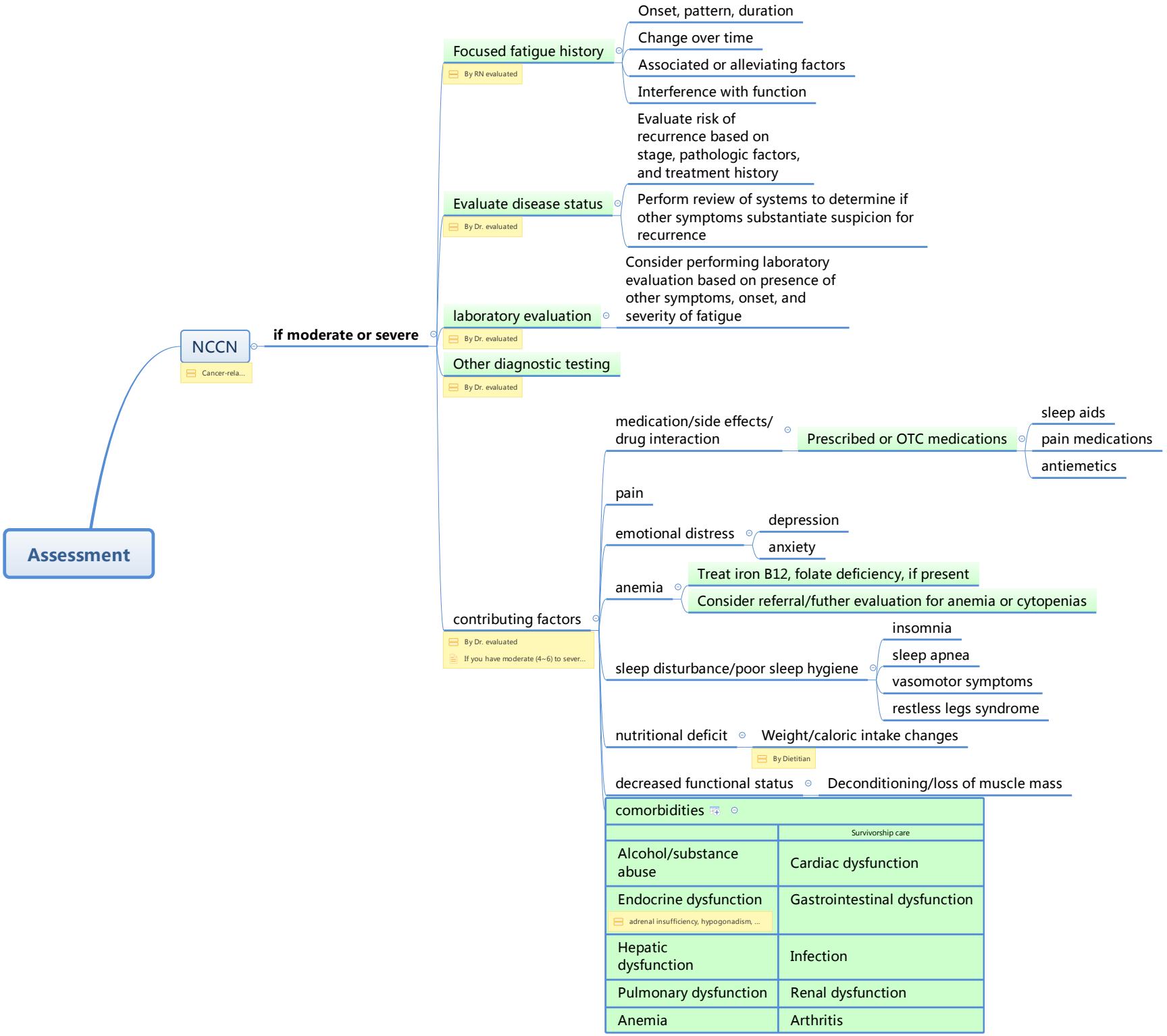
Two psychological problems (ACS; NCI)

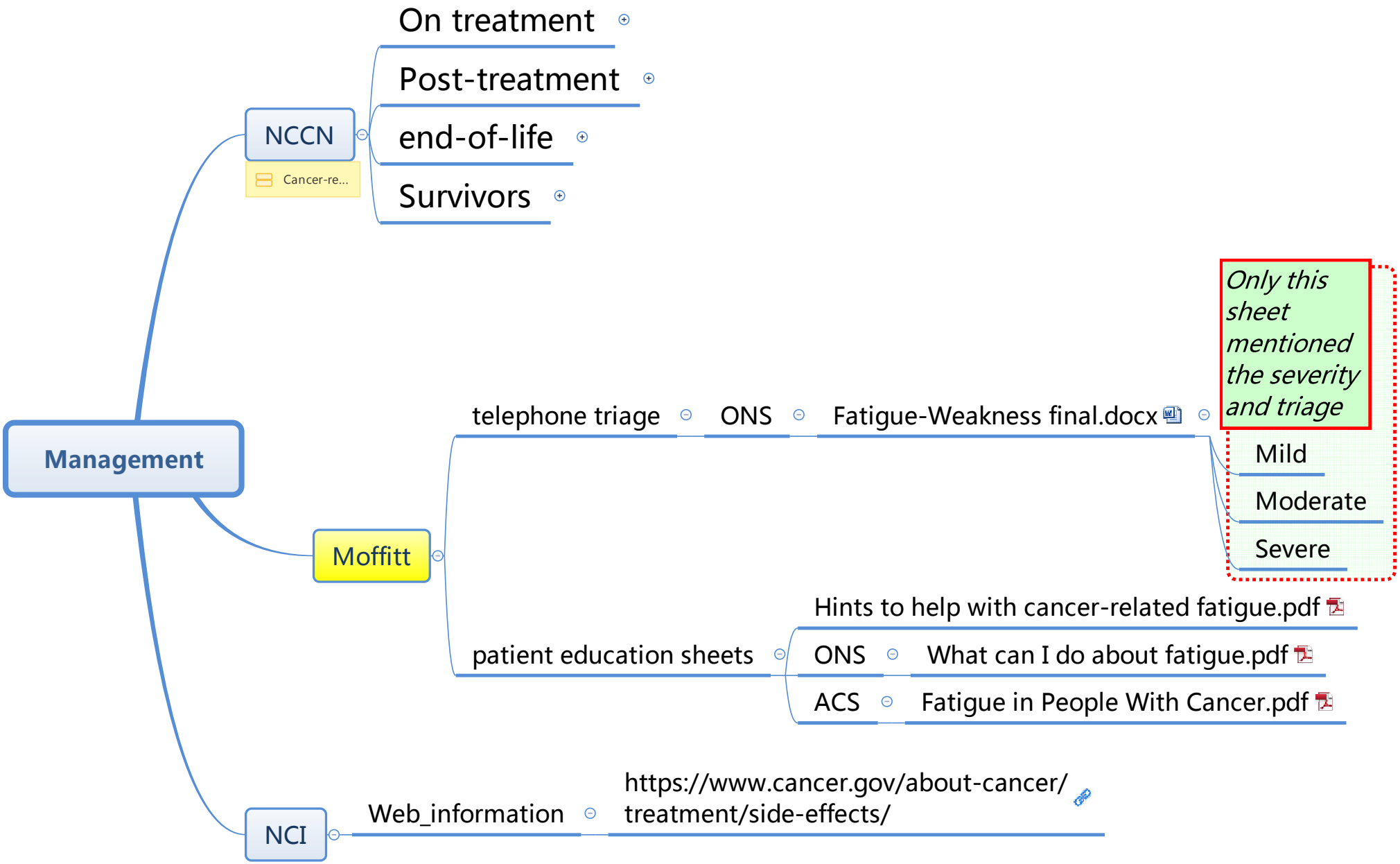

Clinical pathway principals
ASCO-Clinical-Pathways-Checklist.pdf
Three stages
ASCO
Development
8 items
Stakeholder
Expert Driven
Evidence-based
Patient-focused
Clinically driven
Timely
Comprehensive
promote participation in clnical trials
Implementation and use
3 items
Analysis
3 items

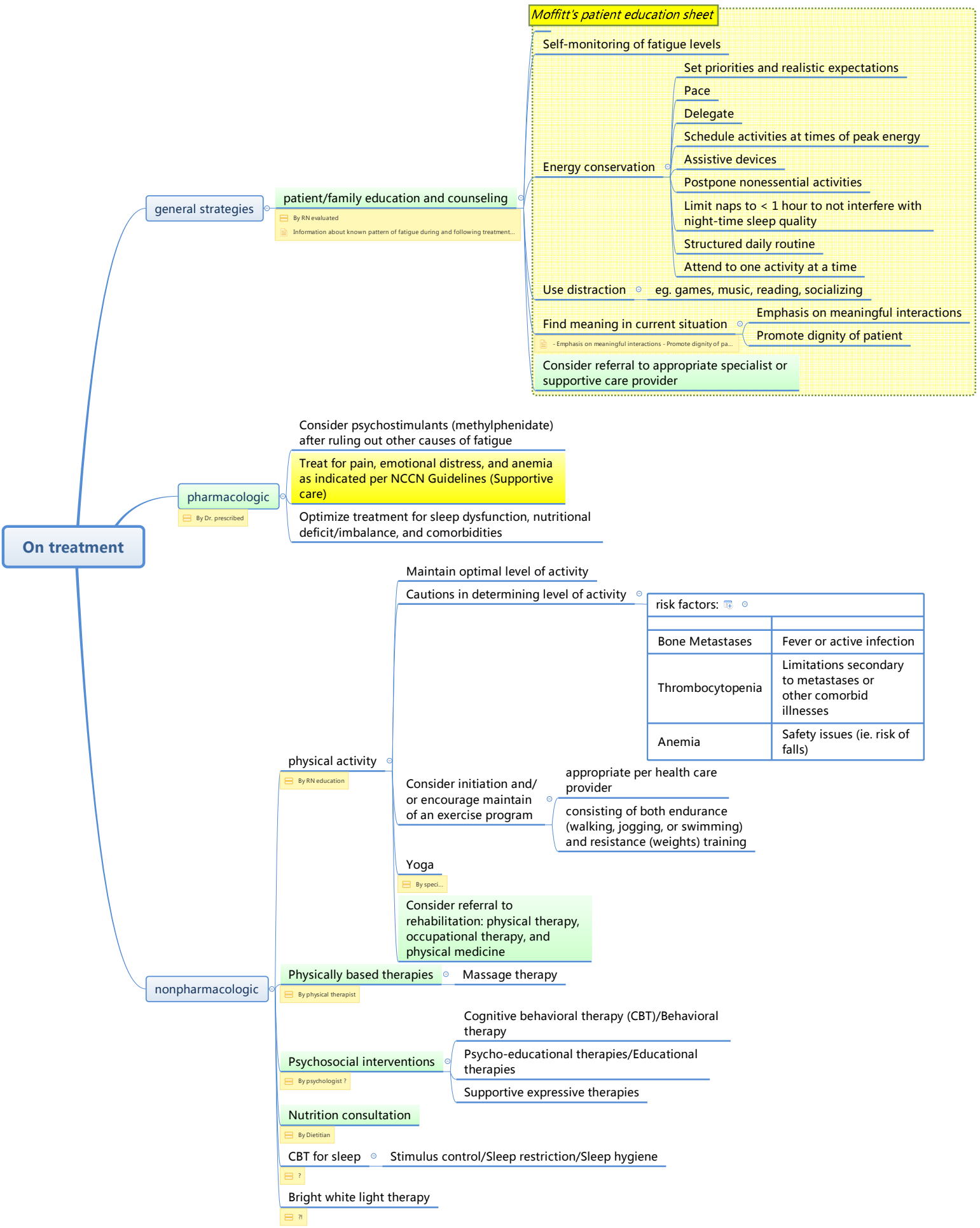

Implementation and use
3 items
Evaluation
timing
two weeks
ACI suggested
ASCO suggested
OPD visits
at admission
one month
Managements
by treatment plan/ phase
Active treatment
Post treatment
End-of-life
Survivorship
by symptom severity
None
Mild
Moderate
Severe
referral
Hui_2016PalliatveCareReferral.pdf
time-based
within 3 months of advanced cancer diagnosis for patients with median survival of 1 year or less, and progressive disease
needs-based
symptom severity: 7-10 (severe)
auto-referral
symptom severity: 4-6 (moderate)
by Dr
By RN
Patient request
by Dr
By RN
Screening
Instruments
ESAS
two physical problems
Tiredness/fatigue
Difficult sleep
two emotional problems
Anxiety
Depression
implementation
tablet
smartphone
monitor
severity
0; Nona
1~3; mild
4~6; moderate
7~10; severe
Sometimes, it is easy to confuse by NCCN terminology.
assessment
Health history
Physical examination
laboratory testing
Images
Bloods
Instruments
Sleep monitor
physical functions

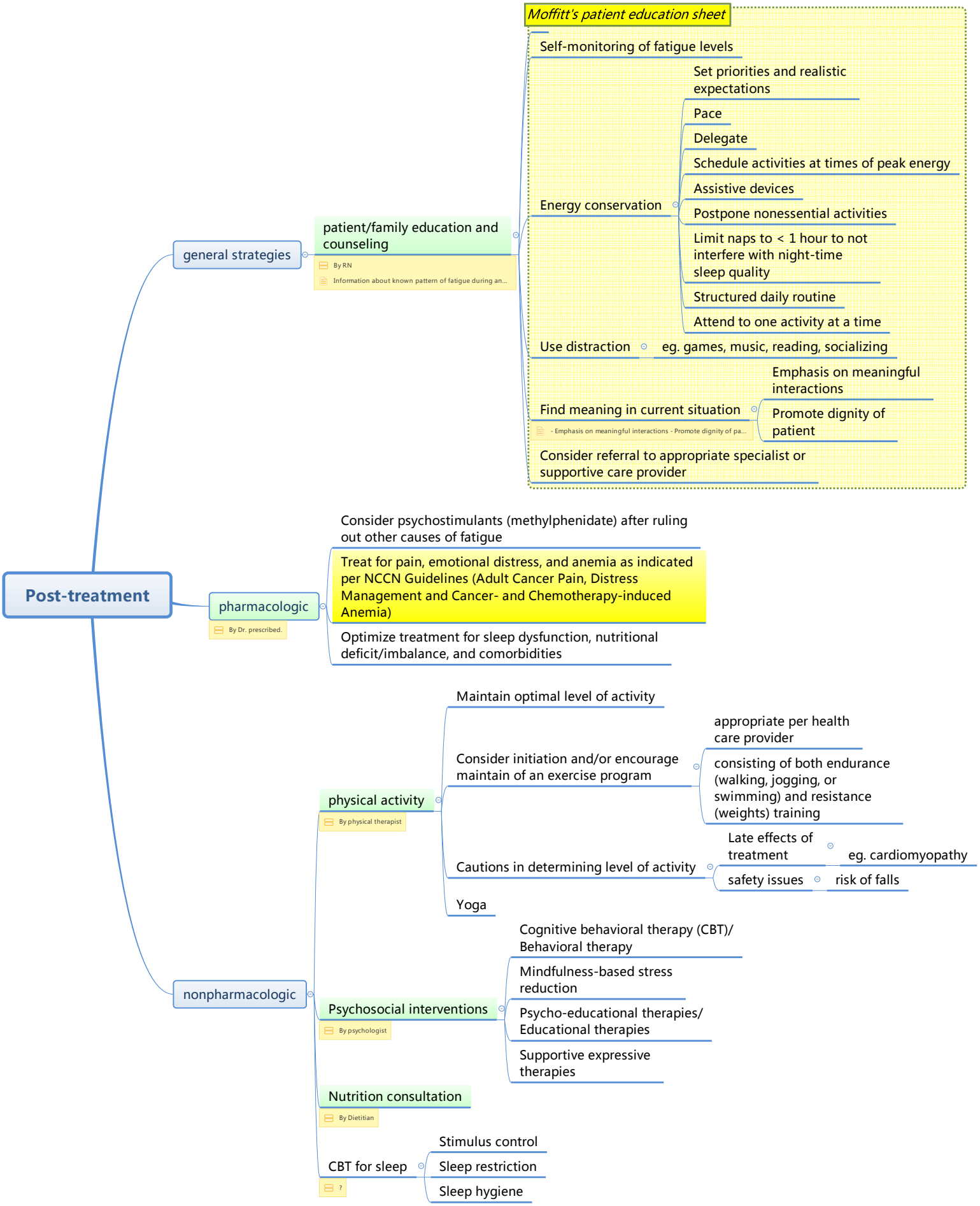

Tiredness/Fatigue
Screening
Assessment
Example
Implementing the Fatigue Guidelines.pdf
Evaluation
NCCN
Repeat screening and evaluation
duration ?
Cancer-re...
Management

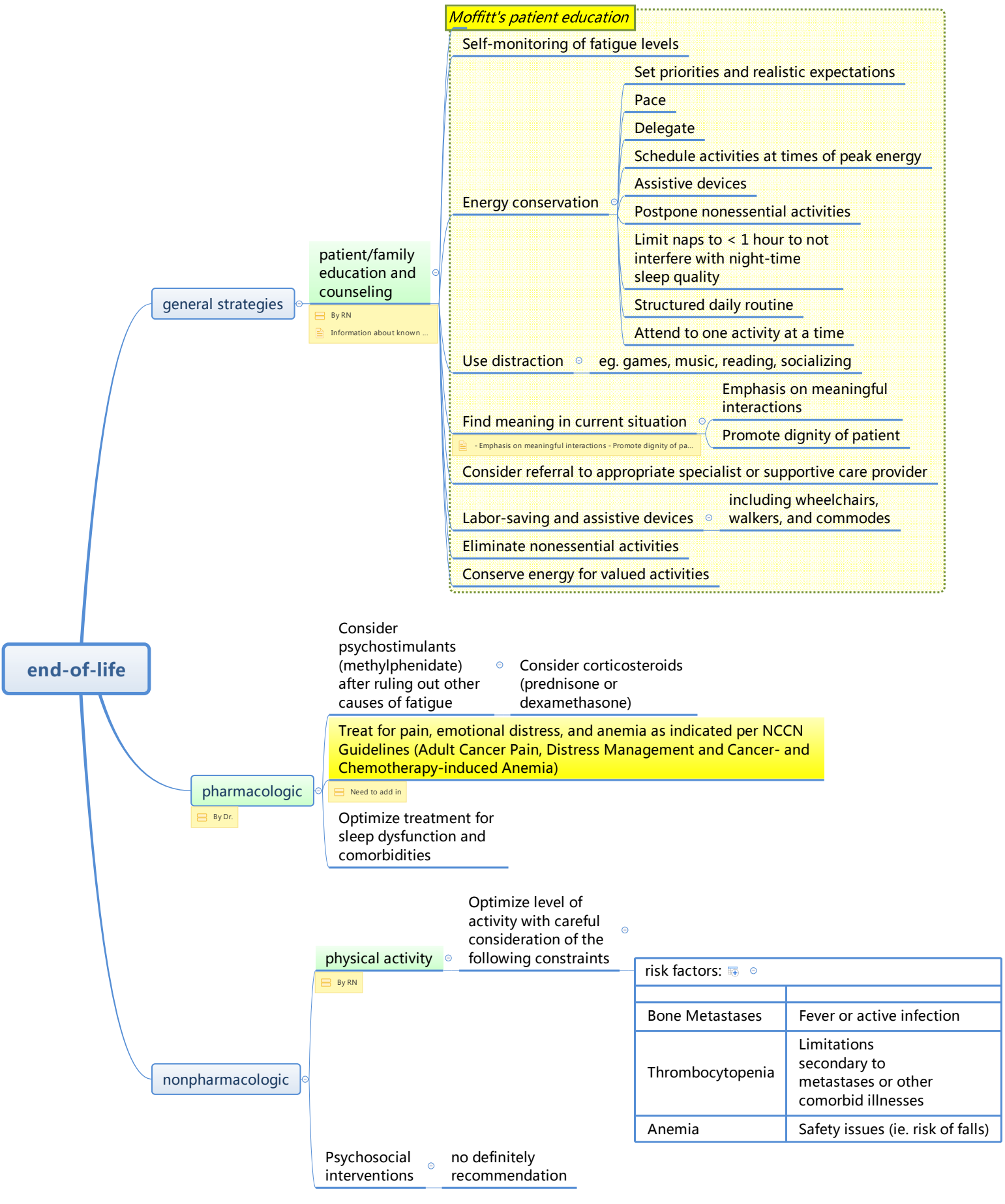

Screening
NCCN
Cancer-re...
screening
By RN evaluated
age > 12years
severity
Nono; 0
Mild; 1~3
Education, counseling, and general strategies for management of fatigue with an emphasis on continued surveillance
Moderate; 4~6
severe; 7~10
Education, counseling, and general strategies for management of fatigue

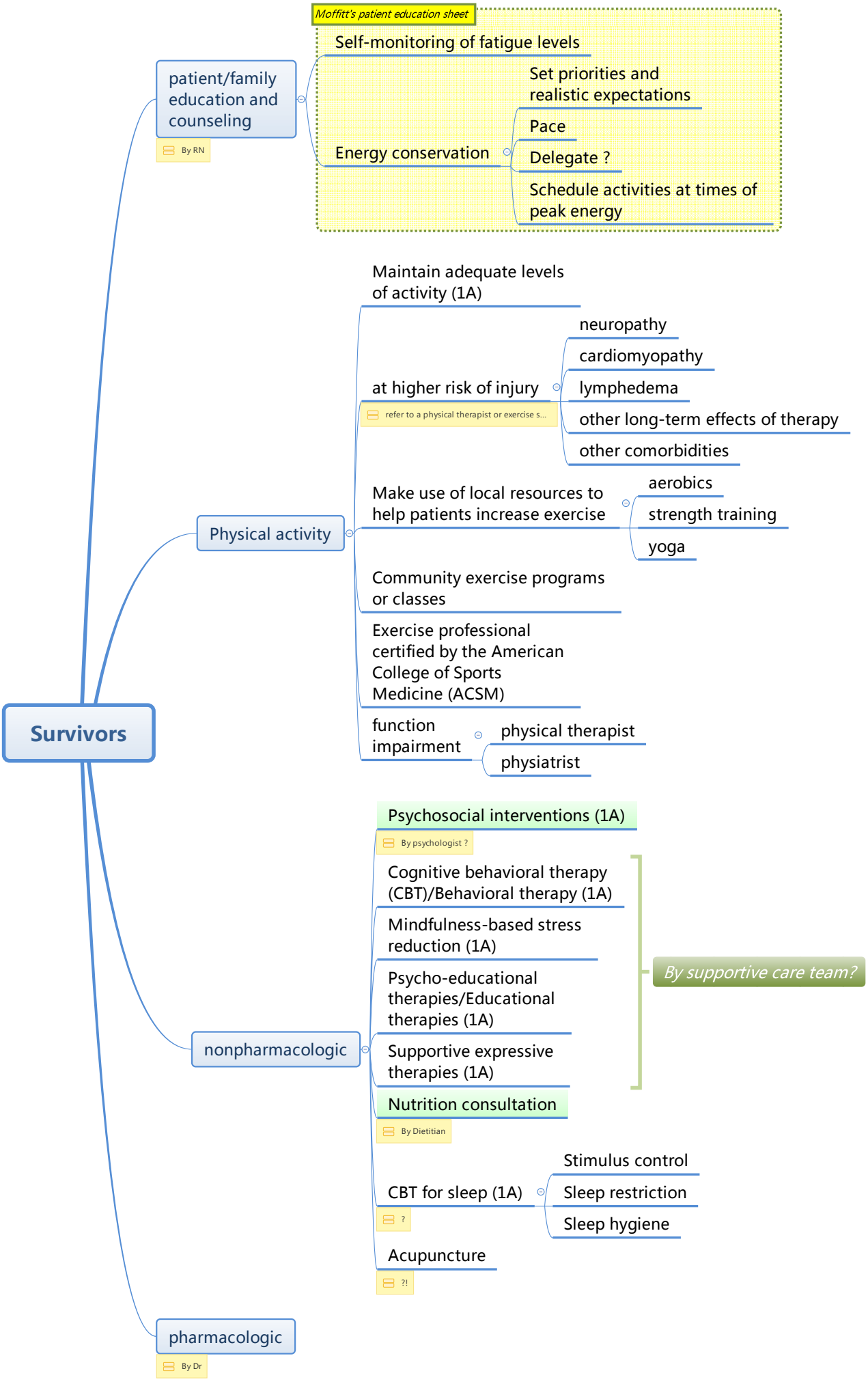

Assessment
NCCN
Cancer-rela...
if moderate or severe
Focused fatigue history
By RN evaluated
Onset, pattern, duration
Change over time
Associated or alleviating factors
Interference with function
Evaluate disease status
By Dr. evaluated
Evaluate risk of recurrence based on stage, pathologic factors, and treatment history
Perform review of systems to determine if other symptoms substantiate suspicion for recurrence
laboratory evaluation
By Dr. evaluated
Consider performing laboratory evaluation based on presence of other symptoms, onset, and severity of fatigue
Other diagnostic testing
By Dr. evaluated
contributing factors
By Dr. evaluated
If you have moderate (4~6) to sever...
medication/side effects/ drug interaction
Prescribed or OTC medications
sleep aids
pain medications
antiemetics
pain
emotional distress
depression
anxiety
anemia
Treat iron B12, folate deficiency, if present
Consider referral/futher evaluation for anemia or cytopenias
sleep disturbance/poor sleep hygiene
insomnia
sleep apnea
vasomotor symptoms
restless legs syndrome
nutritional deficit
Weight/caloric intake changes
By Dietitian
decreased functional status
Deconditioning/loss of muscle mass
comorbidities
Survivorship care
Alcohol/substance abuse
Cardiac dysfunction
Endocrine dysfunction
adrenal insufficiency, hypogonadism, ...
Gastrointestinal dysfunction
Hepatic dysfunction
Infection
Pulmonary dysfunction
Renal dysfunction
Anemia
Arthritis


Management
NCCN
Cancer-re...
On treatment
Post-treatment
end-of-life
Survivors
Moffitt
telephone triage
ONS
Fatigue-Weakness final.docx
Only this sheet mentioned the severity and triage
Mild
Moderate
Severe
patient education sheets
Hints to help with cancer-related fatigue.pdf
ONS
What can I do about fatigue.pdf
ACS
Fatigue in People With Cancer.pdf
NCI
Web_information
https://www.cancer.gov/about-cancer/treatment/side-effects/


On treatment
general strategies
patient/family education and counseling
By RN evaluated
Information about known pattern of fatigue during and following treatment...
Moffitt's patient education sheet
Self-monitoring of fatigue levels
Energy conservation
Set priorities and realistic expectations
Pace
Delegate
Schedule activities at times of peak energy
Assistive devices
Postpone nonessential activities
Limit naps to < 1 hour to not interfere with night-time sleep quality
Structured daily routine
Attend to one activity at a time
Use distraction
eg. games, music, reading, socializing
Find meaning in current situation
Emphasis on meaningful interactions
Promote dignity of patient
- Emphasis on meaningful interactions - Promote dignity of pa...
Consider referral to appropriate specialist or supportive care provider
pharmacologic
By Dr. prescribed
Consider psychostimulants (methylphenidate) after ruling out other causes of fatigue
Treat for pain, emotional distress, and anemia as indicated per NCCN Guidelines (Supportive care)
Optimize treatment for sleep dysfunction, nutritional deficit/imbalance, and comorbidities
nonpharmacologic
physical activity
By RN education
Maintain optimal level of activity
Cautions in determining level of activity
risk factors:
Bone Metastases
Fever or active infection
Thrombocytopenia
Limitations secondary to metastases or other comorbid illnesses
Anemia
Safety issues (ie. risk of falls)
Consider initiation and/ or encourage maintain of an exercise program
appropriate per health care provider
consisting of both endurance (walking, jogging, or swimming) and resistance (weights) training
Yoga
By speci...
Consider referral to rehabilitation: physical therapy, occupational therapy, and physical medicine
Physically based therapies
Massage therapy
By physical therapist
Psychosocial interventions
By psychologist ?
Cognitive behavioral therapy (CBT)/Behavioral therapy
Psycho-educational therapies/Educational therapies
Supportive expressive therapies
Nutrition consultation
By Dietitian
CBT for sleep
Stimulus control/Sleep restriction/Sleep hygiene
?
Bright white light therapy
?!


Post-treatment
general strategies
patient/family education and counseling
By RN
Information about known pattern of fatigue during an...
Moffitt's patient education sheet
Self-monitoring of fatigue levels
Energy conservation
Set priorities and realistic expectations
Pace
Delegate
Schedule activities at times of peak energy
Assistive devices
Postpone nonessential activities
Limit naps to < 1 hour to not interfere with night-time sleep quality
Structured daily routine
Attend to one activity at a time
Use distraction
eg. games, music, reading, socializing
Find meaning in current situation
Emphasis on meaningful interactions
Promote dignity of patient
- Emphasis on meaningful interactions - Promote dignity of pa...
Consider referral to appropriate specialist or supportive care provider
pharmacologic
By Dr. prescribed.
Consider psychostimulants (methylphenidate) after ruling out other causes of fatigue
Treat for pain, emotional distress, and anemia as indicated per NCCN Guidelines (Adult Cancer Pain, Distress Management and Cancer- and Chemotherapy-induced Anemia)
Optimize treatment for sleep dysfunction, nutritional deficit/imbalance, and comorbidities
nonpharmacologic
physical activity
By physical therapist
Maintain optimal level of activity
Consider initiation and/or encourage maintain of an exercise program
appropriate per health care provider
consisting of both endurance (walking, jogging, or swimming) and resistance (weights) training
Cautions in determining level of activity
Late effects of treatment
eg. cardiomyopathy
safety issues
risk of falls
Yoga
Psychosocial interventions
By psychologist
Cognitive behavioral therapy (CBT)/ Behavioral therapy
Mindfulness-based stress reduction
Psycho-educational therapies/ Educational therapies
Supportive expressive therapies
Nutrition consultation
By Dietitian
CBT for sleep
?
Stimulus control
Sleep restriction
Sleep hygiene


end-of-life
general strategies
patient/family education and counseling
By RN
Information about known ...
Moffitt's patient education
Self-monitoring of fatigue levels
Energy conservation
Set priorities and realistic expectations
Pace
Delegate
Schedule activities at times of peak energy
Assistive devices
Postpone nonessential activities
Limit naps to < 1 hour to not interfere with night-time sleep quality
Structured daily routine
Attend to one activity at a time
Use distraction
eg. games, music, reading, socializing
Find meaning in current situation
Emphasis on meaningful interactions
Promote dignity of patient
- Emphasis on meaningful interactions - Promote dignity of pa...
Consider referral to appropriate specialist or supportive care provider
Labor-saving and assistive devices
including wheelchairs, walkers, and commodes
Eliminate nonessential activities
Conserve energy for valued activities
pharmacologic
By Dr.
Consider psychostimulants (methylphenidate) after ruling out other causes of fatigue
Consider corticosteroids (prednisone or dexamethasone)
Treat for pain, emotional distress, and anemia as indicated per NCCN Guidelines (Adult Cancer Pain, Distress Management and Cancer- and Chemotherapy-induced Anemia)
Need to add in
Optimize treatment for sleep dysfunction and comorbidities
nonpharmacologic
physical activity
By RN
Optimize level of activity with careful consideration of the following constraints
risk factors:
Bone Metastases
Fever or active infection
Thrombocytopenia
Limitations secondary to metastases or other comorbid illnesses
Anemia
Safety issues (ie. risk of falls)
Psychosocial interventions
no definitely recommendation


Survivors
patient/family education and counseling
By RN
Moffitt's patient education sheet
Self-monitoring of fatigue levels
Energy conservation
Set priorities and realistic expectations
Pace
Delegate ?
Schedule activities at times of peak energy
Physical activity
Maintain adequate levels of activity (1A)
at higher risk of injury
refer to a physical therapist or exercise s...
neuropathy
cardiomyopathy
lymphedema
other long-term effects of therapy
other comorbidities
Make use of local resources to help patients increase exercise
aerobics
strength training
yoga
Community exercise programs or classes
Exercise professional certified by the American College of Sports Medicine (ACSM)
function impairment
physical therapist
physiatrist
nonpharmacologic
Psychosocial interventions (1A)
By psychologist ?
Cognitive behavioral therapy (CBT)/Behavioral therapy (1A)
Mindfulness-based stress reduction (1A)
Psycho-educational therapies/Educational therapies (1A)
Supportive expressive therapies (1A)
By supportive care team?
Nutrition consultation
By Dietitian
CBT for sleep (1A)
?
Stimulus control
Sleep restriction
Sleep hygiene
Acupuncture
?!
pharmacologic
By Dr