

“Zoom”ing to the Kitchen: A Novel Approach to Virtual Nutrition Education for Primary Care Residents

Justin Charles, MD., Katherine Gielissen, MD, MHS

Background: Poor nutrition is a leading global risk factor for chronic disease. Nutritional interventions can be used as first-line therapy for prevention, treatment, and reversal of chronic disease. However, there is a lack of evidence-based, experiential nutrition education for medical trainees, leaving them largely unprepared to address nutritional issues with patients. The need for virtual didactic sessions during the COVID-19 pandemic has created additional challenges to deliver innovative and interactive educational content.

Specific Aim: To assess the impact of a 4-hour, interactive, virtual nutrition curriculum (4INC) on residents' attitudes regarding importance of nutrition, nutrition knowledge, and comfort with and likelihood of performing dietary history and nutrition counseling.

Hypothesis: A 4INC can significantly improve resident knowledge of evidence-based nutrition, attitudes towards the importance of nutrition in preventing and managing NCDs, and confidence in performing nutrition counseling

Methods: 53 residents in the Yale Primary Care Internal Medicine and Medicine-Pediatrics (YPCMP) programs were randomized into control (n=11) and intervention (n=42) groups. The intervention group received a 4-hour, interactive nutrition curriculum (4INC) via Zoom. Educational content included plant-based nutrition for chronic disease prevention and treatment, taking dietary histories and performing nutrition counseling, and an introduction to culinary medicine. To determine the effect of the curriculum on residents' nutrition knowledge, self-reported attitudes, history taking and counseling practices, an anonymous online survey with Likert scale was used. Demographics between control group and intervention group were compared using t-test for continuous variables and chi-squared test for nominal variables. Satisfaction scores were summarized using N and percent for each category and each question. Changes between pre- and post-test responses for the intervention group were analyzed using paired t-tests for continuous variables and Stuart-Maxwell tests for categorical variables. The significance level was set as $p < 0.05$, two-sided.

Results: There was no statistical difference between intervention and control groups in terms of age, training year, program, prior nutrition degree, or hours spent in self-study or structured nutrition education. About 90% of residents were somewhat or extremely satisfied with the curriculum. Post-intervention, residents were more likely to believe that coronary artery disease can be reversed with dietary modification alone. They had more confidence in dietary history taking and nutrition counseling and indicated a higher likelihood of taking dietary histories during patient visits for routine wellness, chronic disease follow-ups, and acute issues. They also reported that they were more likely to perform nutrition counseling for routine wellness visits, chronic disease follow-ups and acute issues. Residents did not demonstrate an increase in knowledge scores.

Conclusions: YPCMP residents were largely satisfied with this novel, 4-hour, interactive, virtual nutrition curriculum that successfully improved resident confidence in and proposed frequency of taking dietary histories and providing nutrition counseling.


Resident Signature


Mentor Signature KATHERINE
GIELISSEN, MD

Title: Barriers to reporting student mistreatment: a peer-to-peer study
Alissa Chen MD MPH, Stephen Holt MD MS

Background: Forty percent of graduating medical students report experiencing student mistreatment, according to the Association of American Medical College's graduation questionnaire. However, only 23.2% of students choose to report their experiences. Lack of reporting by medical students is a major roadblock to preventing and mitigating the effects of student mistreatment. Steps must be taken to understand why incidents go unreported, as student mistreatment has been shown to cause burnout and a decrease in empathy in affected medical students.

Specific Aim: Determine what barriers prevent medical students from reporting student mistreatment.

Hypothesis: Medical students have a multifaceted approach when deciding whether or not to report mistreatment, and their biggest considerations are fear of reprisal and the culture of the institution.

Methods: Peer-to-peer, semi-structured interviews with current medical students were conducted to understand medical students' experiences with mistreatment. Students were eligible to participate in the study if they were current medical students who experienced mistreatment. Students were recruited via class listservs, and emails were sent to first through fourth year medical students. These interviews were inductively coded, and themes were identified to elucidate why students do not report mistreatment.

Results: Twenty-one students were interviewed who described a total of 34 mistreatment incidents. Participants included one second year medical student (4.8%), nine third year medical students (42.9%), and eleven fourth year medical students (52.3%). The incidents were categorized into six types of mistreatment, verbal abuse being the most common (N = 29, 85.3%). We identified four main factors that students consider when deciding to report mistreatment: personal, situational, structural, and cultural. Personal factors were intrinsically tied to the participant, including their feelings or concerns about mistreatment or their chosen career path. Situational factors related to the act of mistreatment, such as who the perpetrator was or where the mistreatment took place. Structural factors included elements of the reporting system. Cultural factors were concerns related to how the institution or medical community viewed student mistreatment and the student's place in medical education. All participants considered more than one factor in their decision to report mistreatment.

Conclusions: Although the graduation questionnaire is the main source of data regarding student mistreatment, this study found many other types of student mistreatment that are not included in the graduation questionnaire. Therefore, the graduation questionnaire may need to be changed to more accurately represent the incidence of student mistreatment. Additionally, the reason students choose not to report mistreatment is multifaceted. This study found four main factors students consider, and all participants mentioned more than one factor. Therefore, our approach to solving student mistreatment must also be multifaceted. Some factors are easier to target than others. For instance, structural factors can be alleviated through creating better reporting systems, which may include solutions such as quarterly check-ins with students. Personal factors can be targeted by creating more transparency in the reporting process to decrease the concern for reprisal. However, cultural factors may take an extensive, long-term approach to alleviate. Despite this, targeting cultural factors may be the most effective way to prevent student mistreatment. Creating a learning environment which values students will not only prevent student mistreatment, but will also be more conducive to learning and preventing burnout.



Resident's Signature



Mentor's Signature

Epidermal Growth Factor Receptor Pathway and Fibrosis in Systemic Sclerosis Skin

Rebecca Fine, MD, Monique Hinchcliff, MD, MS

Background: Systemic sclerosis (SSc) is an autoimmune disorder characterized by microvascular damage and fibrosis of the skin and internal organs. Tyrosine kinase inhibitors have demonstrated anti-fibrotic effects on SSc skin in clinical studies with variable efficacy and poor tolerance. A skin gene expression signature involving epidermal growth factor receptor (EGFR), a receptor tyrosine kinase, was recently identified to be important in SSc skin disease and correlated with the modified Rodnan skin score (mRSS- a skin pinch test). EGFR activates multiple downstream signaling molecules, including PI3K/AKT (phosphatidylinositol 3-kinase, protein kinase B), MAPK (mitogen-activated protein kinase), and those of the JAK/STAT (janus kinase/signal transducer and activator of transcription), ERK1/2 (extracellular signal-regulated kinases 1/2), and Src pathways.

Specific Aim: The study goal is to identify downstream targets of EGFR activation in order to understand SSc dermal fibrosis on the molecular level.

Hypothesis: We hypothesized that EGFR and downstream pathways are upregulated in SSc patient skin in comparison to healthy control skin.

Methods: Archived formalin fixed paraffin embedded (FFPE) forearm skin biopsies from a cohort of 13 SSc patients who met the ACR 2013 classification criteria and 18 age- and sex-matched healthy control (HC) participants collected at Northwestern University (NW) were sectioned and processed for immunohistochemistry (IHC) staining using antibodies to EGFR, phospho-EGFR (pEGFR), AKT, phospho-AKT (pAKT), ribosomal protein S6, phospho-S6 (pS6), signal transducer and activator of transcription 1 (STAT1), phospho-STAT1 (pSTAT1), STAT4, phospho-STAT4 (pSTAT4), Src, and ERK1/2. Sections from FFPE skin biopsies from a second cohort of three SSc patients and three HC collected at Yale University were stained for pEGFR, pS6, STAT4, SRC, ERK. Non-vascular positively stained fibroblast-shaped cells were counted in ten high powered fields (hpf) in the dermis. IHC staining and fibroblast density were compared with mRSS for each SSc patient. Statistical analysis involved using clustered Spearman correlation for IHC and mRSS.

Results: IHC results of the NW cohort showed that there is significantly increased staining of pEGFR ($p < 0.00007$), S6 ($p < 0.00001$), pS6 ($p < 5.119e-06$), and pSTAT1 ($p < 1.091e-13$) in SSc skin compared to HC skin. There were no statistically significant differences in skin staining between SSc and HCs for EGFR, AKT, pAKT, STAT4, pSTAT4, ERK1/2, or SRC. Expression of pEGFR ($p = 0.008$), S6 ($p < 4.995e-46$), pS6 ($p < 2.674e-07$), and STAT1 ($p < 5.189e-18$) correlated with mRSS. In the Yale cohort, fibroblasts in SSc skin biopsies also stained for pEGFR significantly more than in HCs ($p < 0.016$), and correlated with mRSS ($p < 0.011$). Unlike in the NW cohort, STAT4 was significantly increased in SSc compared to controls ($p = 0.001$), and correlated with mRSS ($p < 0.013$), whereas pS6 did not have increased staining. As was observed in the NW cohort, there were no differences in pSTAT4, SRC, ERK1/2 expression in Yale SSc skin samples compared to HC.

Conclusion: The EGFR pathway is activated in patients with SSc, as evidenced by the increase in staining of pEGFR across cohorts. Our results from the two cohorts revealed activation of EGFR through upregulation of pEGFR in dermal fibroblasts as well as the JAK/STAT pathway via pSTAT1 or STAT4. Our study also highlights the heterogeneity of SSc patients, as evidence for activation of the mTOR pathway via S6 and pS6 was only found in the first cohort. Future studies should explore the clinical implications of these differences and the utility of targeting these downstream pathways for potential therapeutics.

Rebecca Fin
Resident's Signature

Monique Hinchcliff
Mentor's Signature

Title: Trends and Outcomes of Multiple Listings for Adult Cardiac Transplantation in the United States

Michael Fuery, MD, Tariq Ahmad MD, MPH

Background: The United Network for Organ Sharing (UNOS) has allowed transplant candidates to pursue simultaneous transplant registration at multiple centers. Previous analyses of multiple listings in cardiac transplantation from 2000-2013 identified notable disparities: patients with multiple listings were more likely to be white, to have a higher degree of education, and more commonly lower transplant status. It has been posited that multiple listings may advantage patients with enhanced means, but since 2013 there have been no analyses of trends in multiple listings. In 2018, the allocation system was revised to better stratify patients by priority and address geographic disparities which may impact multiple listings.

Specific Aim: To examine trends in sociodemographics and utilization of multiple listings over the last decade and in response to the 2018 allocation system change.

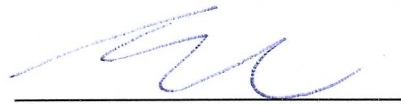
Hypothesis: Multiple listings will be more frequent among traditionally advantaged groups but decrease in prevalence over the last decade.

Methods: The UNOS registry was queried to identify all patients greater than 18 years listed for heart transplantations between January 1, 2010 and May 12, 2020. Patients were stratified as single-listing or multiple listing candidates. Multiple listing was defined as having two or more overlapping registrations at different centers. Patient and donor sociodemographic characteristics and clinical outcomes were compared between the cohorts. Baseline demographics were compared using the Wilcoxon rank-sum test for continuous variables and Pearson's Chi-square test for categorical variables. The absolute number of multiple listings and proportion of multiple listings were plotted over the study period.

Results: Multiple listed patients represented 10.9% of all listings between 2010 and 2020. Multiple listed patients were more likely to be white, to have achieved a higher level of education, and to have private insurance ($p < 0.001$, all). Under the former allocation system, multiple listed patients were more likely a low urgency status (Status 2 22.4% vs 21.2%) but under the new allocation system since 2018 lower urgency patients were more likely single listed (Status 6 5.05% vs 2.8%; $p < 0.001$ all). The number of patients with multiple listings each year increased between 2010 to 2015, then decreased steadily between 2015 and 2020.

Conclusions: Disparities in multiple listings persist but overall these listings have become less prevalent over the last decade. This may be related to improved organ sharing patterns resulting from revisions of the allocation system.


Resident's Signature


Mentor Signature

Resident: Robert Lam, MD

Faculty Mentor: Joseph Lim, MD

Research in Residency Research Summary: Natural History, Risk Factors, and Outcomes of Patients with Biopsy-Confirmed Non-Alcoholic Fatty Liver Disease

Study Purpose: Given there is limited data regarding risk factors and long-term outcomes of U.S. patients with biopsy-proven non-alcoholic fatty liver disease (NAFLD), we studied the role of clinical and histologic risk factors on the long-term prognosis in this population.

Brief review of study methodology: We conducted a retrospective observational cohort study among 450 patients with biopsy-proven NAFLD at Yale-New Haven Hospital from 2012-2019. A liver pathologist evaluated the index biopsy for a series of histologic features, including NAFLD activity score and fibrosis stage (NASH-CRN criteria). Patients with a prior liver transplant or alternative etiologies of chronic liver disease were excluded, including autoimmune/cholestatic liver disorders, viral hepatitis, alcoholic liver disease, and genetic/metabolic liver disorders. Baseline labs, comorbidities, and anthropometric data within 1 month of the index biopsy date were obtained. Duration of risk exposure was determined from the date of the index liver biopsy to the earliest development of an outcome event, or the last follow-up examination. Primary outcome events investigated were the development of cirrhosis, hepatocellular carcinoma (HCC), all-cause mortality, liver decompensation, and any liver-related event. Events within 90s days of the index biopsy were excluded. Kaplan-Meier curves estimated the cumulative probability of the event. Multivariable Cox proportional hazards regression modeling was used to estimate adjusted hazard ratios (HR).

Results: A total of 329 patients (median age 52 years, 43% male) met inclusion criteria. Comorbidities included hypertension (58%), obesity (67%), diabetes (47%), and coronary artery disease (9%). Over a median follow-up time of 3.2 years (IQR 4.6 years), 33 patients (10%) developed cirrhosis, 11 patients (3%) developed HCC, 33 patients (10%) died, 35 patients (11%) developed liver decompensation, and 63 patients (19%) had a liver-related event. Among histologic risk factors, stage 3 (HR 2.49, 95% CI 1.09-5.69) and stage 4 (HR 6.25, 95% CI 3.23-12.11) liver fibrosis had a significantly greater rate of liver-related events compared to stage 0-1 fibrosis. Stage 4 fibrosis alone significantly increased the rate of liver decompensation (HR 7.39 95% CI 2.86-19.15) and HCC (HR 16.9, 95% CI 1.95-147.40) compared to stage 0-1 fibrosis. Among clinical risk factors, obesity (HR 2.48, 95% CI 1.18-5.23) was significantly associated with liver decompensation. No other clinical risk factors or histologic features were significantly associated with the primary outcome events.

Conclusion: In a longitudinal study of patients with biopsy-proven NAFLD, advanced fibrosis and obesity were primary risk factors for developing liver-related events, including cirrhosis, liver decompensation, and HCC. These results further support prioritization of patients with advanced fibrosis for NASH-directed therapy.



Robert Lam, MD



Joseph Lim, MD

Postobstructive pneumonia among older adults with advanced cancer

Lisa O'Donovan, MD, Rupak Datta, MD, PhD, Manisha Juthani-Mehta, MD, Vincent Quagliarello, MD

Background: Postobstructive pneumonia is one subset of pneumonia often seen in patients with advanced malignancy. While it is a known clinical condition, there are only a handful of studies describing its prevalence and clinical course. One landmark study by Rolston et al. prospectively compared veterans who were hospitalized with postobstructive pneumonia to those admitted for bacterial community-acquired pneumonia (CAP) over a two-year period. This study found that 5.4% of patients hospitalized for CAP had postobstructive pneumonia with the obstruction caused by malignancy in all cases. The researchers found postobstructive pneumonia to be a clinical entity distinct from bacterial pneumonia with significantly higher 30-day mortality. Nevertheless, there is a paucity of data on the prevalence of postobstructive pneumonia among older adults already diagnosed with advanced malignancy.

Specific Aim: To determine the prevalence of postobstructive pneumonia among hospitalized patients with advanced cancer receiving palliative chemotherapy diagnosed with pneumonia. The secondary aim is to assess patterns of antimicrobial use in those found to have postobstructive pneumonia.

Hypothesis: Less than 10% of this hospitalized patient population with pneumonia will have postobstructive pneumonia.

Methods: We conducted a cohort study of patients ≥ 65 years of age with advanced cancer who were hospitalized with pneumonia based on CDC criteria after receiving palliative chemotherapy between 01/2016 to 09/2017 at Yale New Haven Hospital. Patients with stage III-IV solid tumors and stage III-IV lymphomas or liquid tumors were considered to have advanced malignancy. We identified a subset of patients with definite postobstructive pneumonia, defined as a pulmonary infiltrate that occurred exclusively distal to an obstructed bronchus, or probable postobstructive pneumonia, defined as a pulmonary infiltrate that occurred contiguous with but not exclusively distal to an obstructive bronchus, based on chest x-ray and computed tomography (CT). For each patient, we collected demographics, cancer type, and hospitalization stay characteristics. Antimicrobial use was also assessed during the index hospitalization.

Results: Among the 124 patients with advanced malignancy in this cohort who were admitted for pneumonia, 9 had postobstructive pneumonia (7.3%). Of those 9 patients, the most common cancer type was lung (5 patients had non-small cell lung cancer and 1 patient had small cell lung cancer). Review of diagnostic studies showed all 9 patients had blood cultures drawn and 7 of the 9 patients (77.8%) had respiratory viral panels sent. All 9 patients had a CT chest performed and 5 of the 9 patients (55.6%) underwent therapeutic thoracenteses. The most commonly used antibiotic classes were penicillin and glycopeptide; all 9 patients (100%) were on both classes at some point in their hospitalization. Finally, 6 of the 9 patients (66.7%) had 90-day mortality and 2 patients had 90-day readmission related to infection (22.2%).

Conclusion: 7.3% of adults with advanced malignancy receiving palliative chemotherapy who were hospitalized with pneumonia had postobstructive pneumonia. Although no standard guidelines for antimicrobial use currently exist for postobstructive pneumonia, most patients in this cohort were treated with broad-spectrum antibiotics. Our study suggests that postobstructive pneumonia should be suspected in those with advanced malignancy, particularly lung cancer, and pneumonia. Our next step is to compare these 9 patients with postobstructive pneumonia to the remaining 115 patients with non-postobstructive pneumonia to assess for differences between groups.



Disclosure of financial conflicts of interest among panel members producing clinical practice guidelines in Canada and United States in 2020

Laura Glick, M.D., Joseph Ross, M.D.

Background: the Institute of Medicine (IOM) defines clinical practice guidelines (CPGs) as "statements that include recommendations, intended to optimize patient care, that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options." Guidelines provide a formal framework on managing patients with specific conditions. They are meant to be evidence-based, rigorously reviewed and follow a transparent process. One of the most important ways to ensure transparency and minimize potential or perceived bias includes requiring all guideline authors to disclose any potential COIs. The IOM Committee on Standards for Developing Trustworthy Clinical Practice Guidelines recommends written disclosure of any commercial, noncommercial, intellectual, institutional, patient, or public activity pertinent to the guideline scope. Several studies have shown that COIs among panel members producing clinical practice guidelines are often not disclosed and managed appropriately.

Specific aim: to determine the prevalence of financial conflicts of interest (COIs) among members of panels producing clinical practice guidelines published in 2020.

Hypothesis: we hypothesize that committee members developing clinical practice guidelines in 2020 will have considerable COIs and that these COIs will be underreported.

Methods: we conducted a cross-sectional study to analyze financial COIs among members of guideline panels who participated in the development of clinical guidelines in North America (United States and Canada) in the year 2020. Guidelines published in 2020 from all the societies who are members of the Council of Medical Specialty Societies were included. If a society had more than one guideline published in 2020, the guideline with the greater number of panel members was analyzed. Based on previous studies, a COI was defined as a direct compensation of a guideline panelist by a manufacturer of a drug used to treat the disease of interest in the guideline, in the form of grants (including research), speakers' fees, honorariums, consultant/adviser/employee relationships, and stock ownership. We searched each guideline for declaration of COI by the panel members. We then searched openpayments.com, a national disclosure program through the Centers for Medicare & Medicaid Services to compare the disclosures of the panel members in the published guideline to this public database of disclosures for the three years prior to the guideline publication (2017, 2018, 2019). We chose three years based on a recent article published by the ACP on the methods ACP uses to disclose conflicts of interests. Only payments that exceeded \$100 were considered a COI. These COIs were differentiated into 1) consulting fees 2) food and beverage 3) travel and lodging 4) honoraria and 5) services other than consulting.

Results: Of the 45 societies in the Council of Medical Specialty Societies, 29 had clinical practice guidelines published in 2020. Of the 582 panel members, 379 (65.1%) reported a COI at the time of publication. Among the 203 members who did not declare a COI, 69 (34%) were found to have at least one COI on OpenPayments. Of the 379 panel members who reported a COI, 140 (37%) had at least one COI that was different from what was disclosed. Twenty (69%) of the guidelines identified a chair of the panel. Of these twenty chairs, 18 (90%) disclosed having a COI and 15 (75%) of the chairs had at least one additional COI that was not disclosed. Further data analysis will compare which types of COI (eg. Consulting fees vs. food and beverage vs. travel and lodging) were more likely to be undisclosed, the total amount of financial COIs that were undisclosed and whether the sex, rank of panel member (eg. professor vs. associate professor vs. assistant professor) and institution (top 25 hospital vs. not) were more likely to be undisclosed.

Conclusion: The number of conflicts of interest that are disclosed by panel members publishing clinical guidelines continues to be underreported. To ensure that guidelines are evidence-based, rigorously reviewed, and transparent, additional steps must be taken to confirm properly disclosed COIs.

Laura Glick

Laura Glick, MD

Joseph Ross

Joseph Ross, MD

Title: A Qualitative Study of Drivers for Use of the Primary Care Exception Among Internal Medicine Teaching Faculty

Authors: Roshni Patel, M.D., Katherine Gielissen, M.D.

Background/Aims: The Primary Care Exception (PCE) is a billing rule created by the Centers for Medicare and Medicaid Services (CMS) which allows supervising physicians to bill for the care of a patient without direct supervision of the resident in ambulatory settings. There are limited regulations for use of the PCE. CMS does not provide guidance to institutions on how to apply the PCE among trainees, nor defines how to best determine individual trainee readiness for indirect supervision. Previous studies have demonstrated that entrustment is a key piece for unsupervised practice, but this has not been examined through the lens of the PCE. This qualitative study seeks to explore what factors influence attending use of the PCE for a given clinical encounter and how they develop trust with their trainees in ambulatory settings.

Methods: Participants in this qualitative, multi-institutional study were supervising attendings from Yale and University of Connecticut Schools of Medicine, representing four internal medicine training programs. A semi structured interview template was developed based on previously defined axes from the entrustment literature including characteristics of supervisors, trainees, their relationship, tasks, and the environment. Faculty were recruited via purposive and snowball sampling techniques over email. Interviews were conducted and recorded via the Zoom platform, then transcribed. The study team employed thematic content analysis using a grounded theory approach to identify major themes among attending responses regarding use of the PCE.

Results: 27 interviews were complete at time of data analysis. Four predominant categories were identified that positively and negatively influenced individual use of the PCE, including attending related-factors, resident-related factors, patient-related factors, and the clinical environment itself. Among attending-related factors “reflexive trust,” which includes internal rules and prior experience with trainees, was a significant driver of PCE non-use regardless of the trainee, patient, or clinical context. Among resident-related factors there was a common conflict between use of PCE to promote resident autonomy vs non-use of PCE to promote educational opportunities. Among factors related to the clinical environment, telehealth was a large driver of PCE use regardless of other visit factors.

Conclusions: Data analysis reveals that use of the PCE involved complex internal decision-making schema in which attendings weighed internal, patient, resident, and environmental-related factors that lead them towards or away PCE use. Many attendings revealed that decisions regarding PCE use were largely driven by the clinical environment or internal processes that supersede other influencing factors, leaving room for potential bias in determining individual trainee readiness for independent practice. This identifies a need for dedicated training for attendings on appropriate PCE use or perhaps a need for an improved system for standardized evaluation of trainees to determine competency and readiness for independent practice.



Resident's signature



Mentor's signature

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Lisa O'Donovan, MD, Rupak Datta, MD, PhD, Manisha Juthani-Mehta, MD, Vincent Quagliarello, MD

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Research in Residency: Research Summary

Utilization and Quality of Tele-Palliative Care During the Covid-19 Pandemic

Resident: Ann A Soliman, MD | Faculty mentor: Kathleen M. Akgün, MD

Restatement of Specific aim and hypothesis

The specific aims of this project are to:

1. Characterize the utilization and compare the quality of tele-palliative care (TPC) to in-person palliative care consultation, before and during the first 6 months of the COVID-19 pandemic at a single institution.
 - H1a. TPC frequency increased during the early months of the COVID-19 pandemic wave and decreased with reduced COVID-19 prevalence in the community.
 - H1b. TPC quality was not significantly different from in-person palliative care consultation.

Brief Review of Methods

We conducted an electronic health record review (n=5 reviewers) of inpatients who received palliative care consultation and were hospitalized during three time periods: pre-COVID 1/2020-3/2020 (in-person only); peak-COVID 3/2020-6/2020 (majority TPC); and post-peak 9/2020-10/2020 (hybrid in-person and TPC). We examined the relationship between time periods and demographic/clinical characteristics (age, sex, race; palliative performance scale [PPS; 0-100 scale, lower numbers indicating worse outcomes]; intensive care unit [ICU] stay; mortality), consult reason, and 7 established National Consensus Project quality measures. Data abstraction was entered in REDCap software. We used descriptive and bivariate statistics to describe differences by time period; Cohen's Kappa coefficient was used to calculate interrater reliability, with at least 10 overlapping reviews between groups of 2-3 reviewers. All analyses were done with SPSS. This study was deemed exempt by the Yale University IRB.

Results

By time period, we included: 50 pre-COVID, 272 peak-COVID, and 56 post-peak. Overall, mean patient age was 69.3 years (standard deviation 15.5), 54.9% were male, 68.7% White, 22.8% Black, 10.6% Hispanic/Latino, and 10.1% with non-English primary language; there were no significant demographic differences across time periods. Relative to the pre-COVID and post-peak groups, patients admitted during the peak period had lower mean PPS scores, longer ICU lengths of stay, and higher in-hospital mortality. Consults were more likely for goals of care (30.0% vs. 53.9% vs. 57.1%, respectively, $p=0.005$) or hospice (4.0% vs. 14.4% vs. 5.4%, respectively, $p=0.031$) during peak-COVID compared with pre-pandemic; consults for goals of care remained high post-peak. Among quality measures, there were lower rates of assessment of physical (98.0% vs. 63.5% vs. 94.6% respectively, $p<0.001$) and psychological symptoms (90.0% vs. 33.1% vs. 67.9% respectively, $p<0.001$) as well as assessment of patient/family understanding of illness (86.0% vs. 62.7% vs. 71.4% respectively, $p=0.004$), compared with pre and post periods. There were no differences in social situation, family burden, and goals of care assessments across time periods.

Conclusion

The PC service provided high quality PC across many domains using TPC, even under significant pandemic-related strain and high patient morbidity and mortality. Future work will evaluate opportunities both to enhance the quality of TPC beyond the initial pandemic surge and for sustained provision of TPC, and may benefit from quality improvement targeting symptom assessment and patient/family understanding.

Resident: Ann Soliman

Mentor: Kathleen Akgün

ENDOSCOPIC ULTRASOUND-FINE NEEDLE BIOPSY (EUS-FNB) DERIVED HUMAN ORGANOID MODELS IN PANCREATIC CANCER: CLINICAL AND TECHNICAL PREDICTORS OF SUCCESS

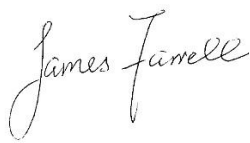
Jin Woo Yoo, M.D., James Farrell, M.D.

Background: Patient-derived tumor organoid (PDTO) models have potential translational research and precision medicine clinical applications in pancreatic ductal adenocarcinoma (PDAC). For PDTOs to be effective clinical tools, they must be highly reproducible in a safe and predictable manner. Success rate of generating PDAC PDTOs has been variable in the literature and is compounded by different methods of tumor sampling including surgical resection, endoscopic ultrasound-guided fine-needle biopsy (EUS-FNB), and radiology-guided biopsy. Vast majority (85%) of PDAC patients undergo biopsy by EUS-FNB but most of the literature has been about surgical. Using a large multicenter cohort, we sought to [1] define the outcomes of a large multi-center EUS-FNB derived PDAC PDTO experience, and [2] study clinical and technical factors associated with successful outcome.

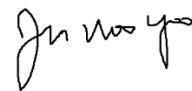
Methods: A combined cohort of PDAC patients and their organoid outcomes were characterized in detail. Successful outcome was defined as either ability to form organoid structures by morphologic criteria within 2 weeks of initiating culture (P0), or ability of established organoid cultures to be maintained and propagated over at least 5 passages (P5). Additional tests included genotyping for characteristic KRAS mutations found in PDAC for all PDTO lines, as well as in vivo formation of organoid-tumors in mice and immunohistochemical analysis in a subset. Statistical analysis was performed using Chi-square test on selected 60+ variables specific to patient (e.g. past medical history, serum markers), tumor (e.g. morphology, prior chemotherapy, staging), acquisition technique (e.g. number of needle passes, specimen transport) and organoid culture (e.g. tissue digestion, culture medium) for correspondence with success.

Results: A total of 95 unique patients were enrolled in this study, in which EUS-FNB sampling was performed to generate a total of 99 patient-organoid dyads. An overall success rate of 82% (n=96) to P0 and 68% (n=93) to P5 was observed. Univariate analysis suggested a correspondence between primary outcomes and: total number of fine-needle passes for EUS-FNB guided tumor sampling ($\chi^2=16.992$, $p=0.005$), total hypoxia time from biopsy to culture ($\chi^2=10.841$, $p=0.028$), type of live cell storage media used ($\chi^2=6.388$, $p=0.041$), length of tissue digestion ($\chi^2=11.103$, $p=0.011$), percent serum content ($\chi^2=7.520$, $p=0.006$). Notably, patient's pre-treatment status did not have correspondence with primary outcomes.

Conclusion: In this EUS-FNB derived PDTO cohort, total number of needle passes, total hypoxia time from biopsy to culture, type of live cell storage media used, and organoid culture related factors including length of tissue digestion and percent serum content appear to be important in determining successful PDAC organoid generation. Clinical factors including prior treatment status were not barriers. Future studies will need to validate these findings and compare them with other biopsy modalities such as IR-guided biopsy and surgical resection.



Mentor's Signature



Resident Signature