Moral Distress Mobile Application

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Abstract

Registered nurses and other healthcare professionals have repeatedly identified moral distress (MoD) as a serious problem yet are still met with a lack of adequate solutions[1]. MoD occurs when an individual feels they know the ethically correct action to take in a situation but are prevented from taking said action, often due to institutional constraints[2]. The Moral Distress Consult Service (MDCS) in the University of Virginia Health System has seen success treating cases of MoD brought to their attention, however, lacks anonymity, often relies on the clinical nurse specialist to report cases, and often only offers delayed symptom relief. In order to address these shortcomings, an application was developed to measure levels of MoD and streamline reporting to the MDCS. Feasibility testing of the application was conducted using seven graduate students in the UVA Nursing program. Results of the study found that the application was satisfactory in the acceptability, implementation, practicality, and expansion subcategories of feasibility. Results from the remaining subcategories of feasibility, demand, adaption, integration, and limited efficacy, were inconclusive and require continued testing with a larger pool of participants.

Keywords: Moral distress, nursing, mobile application

Introduction

Moral distress (MoD) occurs when an individual believes that they are being involuntarily complicit in acting against their professional training or moral value and have little power to act differently or to change the situation. In morally distressing situations, the constraining factors preventing the individual from taking what they believe to be the ethical action are typically institutional[3]. Although MoD is now a well-recognized phenomenon among all healthcare professions[4], few evidence-based strategies have been published to address it. The consequences of untreated MoD among nurses are a greater negative perception of provided patient care, increased danger to patients, and, ultimately, burnout[5]. Burnout is a major contributor to nurse turnover, and one of the main reasons as to why there is currently a nursing shortage in the United States[6]. Finding a means to reduce MoD in hospital working environments is imperative as it will lead to improved provider agency, better patient care, and a higher retention rate of nurses[7]. These benefits impact not only the nurses, but the entire health care system they are a part of. The research team aims to improve MoD intervention by developing a mobile app where the nurses can report cases of MoD in the moment they occur. These reports can be monitored by leaders within the organization and individuals able to make the institutional changes often necessary to treat MoD.

Moral Distress Consultation Service

The Moral Distress Consultation Service (MDCS) consists of a team of consultants trained in MoD that use an interprofessional unit/system-oriented approach to address and improve cases of MoD[3]. The MDCS has been found to significantly reduce levels of MoD, especially among intensive care staff[8]. However, the MDCS has many limitations including often relying on the clinical nurse specialist (CNS) to report cases, lack of anonymity, and lack of resources for real time symptom relief. The development of a mobile application to streamline submission to the MDCS, allowing anonymous submissions, and providing real time resilience resources would allow for more impactful changes to be made in healthcare infrastructures[9].

Quality Indicators

Past methods for dealing with MoD have typically been plagued with a lack of vertical connections. This refers to the ability for those on the bottom rungs of a hierarchy to meaningfully interact with those on the top. This lack of vertical connections has led to a system where most measures to impact risk to patients and hospitals are done retrospectively. However, measures that promote vertical connections lead to faster identification of risks and an increase in probability of proactive measures. Next, the question must be asked of what the information gathered by hospital administrators through vertical connections will be used to proactively solve. In addition to general safety concerns, these proactive measures will allow treatment of what could be called "risky units." This is a major benefit because "risky units" are "units within a hospital that score low on employee engagement, patient experience, and safety culture have higher mortality and costs than higher-scoring units[9]." Getting ahead of these situations before human life is threatened underscores the importance of proactive measures in a healthcare setting, and the identification of them relies heavily on surveys and voluntary feedback. This reliance further demonstrates the necessity of a voluntary feedback system that promotes vertical connections[9].

Methods and Materials

The development cycle was such that we prioritized getting a minimally viable product (MVP) and then iterated adding features.This was a purposeful design decision that is recommended in industry. In order to quickly create an MVP, development of the mobile application began with the front-end graphical user interface (GUI) followed by the backend communication and data storage. The programming language Dart and the Flutter software development kit (SDK) were used to allow the team to develop the application in a platform agnostic language in order to achieve both iOS and Android compatibility, there is also a web version available. A GitHub repository was used to compile code as well as keep track of bugs, issues, or user experience (UX) changes. The utilization of forked repositories allows developers to work in parallel on similar or different projects without interfering with each other or the main branch of code. Following a final review, each developer can push their project to the main branch which is then available in the app.

Front end development consists of architecting the pages that the user will interface with. The objective in this process is to create an appealing system that can be easily integrated with back-end properties. The app draws the user's attention in a designed manner that creates an obvious flow of report generation. A user is first prompted with a MoD thermometer (MDT), in which they can adjust the scale[10]. The MDT is a screening tool to measure MoD in nurses who practice in the hospital setting (Figure 1). The validity and effectiveness of this tool was proven through psychometric testing and a cross-sectional survey design to

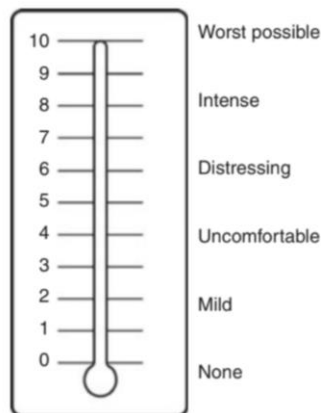compare the thermometer to the Moral Distress Scale-Revised (MDS-R)[10].

Fig. 1. The Moral Distress Thermometer. The Moral Distress Thermometer, developed and psychometrically tested by Lucia Wocial and Michael Weaver is a tool proven to accurately assess levels of moral distress in nurses.

The MDT was implemented into the mobile application as a means for users to rank their levels of MoD in a universal way. As the thermometer is adjusted the color choice changes to indicate a more mild or serious case of MoD. The user is then led to a survey page in which they are unable to move forward from until each question is answered. The survey consists of questions similar to the Measure of MoD for Healthcare Professionals (MMD-HP), which is a linguistically specific tool used to understand the potential causes of MoD[11]. The final step in the process provides the user with a notification of completion as well as a link to resiliency resources that the user can interact with. The mentioned resiliency resources are meant as an immediate aid in which the user can follow mindfulness practices or meditation techniques in order to find short term relief.

The back-end development consists of the infrastructure that supports the requirements of the app. This includes data storage and application programming interfaces (API), which was created using Amazon Web Service (AWS). The goal of back-end development was to enable the application to save and sort the MDT and survey data and allow it to be analyzed by the necessary members of the organization. The POST and GET APIs were first developed to connect the application to the backend AWS resources. The POST API collects the submission information, including date submitted, MDT score, and survey responses, and stores them in AWS. The GET command returns the MDT and survey so they can be edited. For data processing, the functions dailyReport and monthlyReport were created on AWS Lambda, an event-driven, serverless computing platform. The function dailyReport calculates the daily average of MoD scores, and monthlyReport calculates the monthly average. All necessary backend development has been completed, excluding the creation of a login system for the nurses and administrators. The application of a login function allows for the data to be traced to specific nursing units, and if needed a specific nurse. This is done using Auth0 and will be implemented into the software when fully integrated in the UVA Health end users.

The first round of application testing was feasibility testing conducted on graduate students in the UVA Nursing program. Although actively working nurses are the target for this application, on duty nurses were not used for the initial feasibility testing due to their limited amount of time.

However, several graduate students also function as healthcare providers and could potentially provide more insight than an undergraduate or student not yet in the nursing workforce. This study aimed to understand if the application is satisfactory in the eight subcategories of feasibility: acceptability, demand, implementation, practicality, adaptability, integration, expansion, and limited efficacy. These are the constraints that determined what changes needed to be made to the app regarding UX as well as functionality. Acceptability and practicality ensure that the application is both professional and satisfying to use. When deploying a mobile application in an environment such as a hospital, there must exist some criteria that ensure the app is easy to use for working nurses. The question of demand is one of the most important. This was asked to the participants in order to understand how likely they would be to use the app in a real scenario. Implementation is then used to determine if the software works as it is intended to. The graduate students offered an outside point of view that created new test cases into which new bugs could be found. Integration and expansion are used for understanding how quickly the device can be incorporated into different wings or different hospitals. Finally, limited efficacy points towards the sustainability of the project. The answer to each of these questions will provide the necessary information for future UX and infrastructure level application changes.

Results

Application Development

The GUI of the version of the application finalized for testing can be seen in Figure 2. The first screen visible to the user contains a button prompting the user to fill out their level of MoD. This is followed by an interactive MDT where the user can select their level of MoD from a range of 0 to 10. Next, a screen containing a survey focusing on the contributing factors to the specific case of MoD. This is necessary so that the MDCS can better understand the source of MoD and how it can be eliminated or improved. Upon submission of the survey, the application provides a link to real time resilience resources and an option to return to the main page. The data obtained from the MDT and survey is collected in AWS without a name associated.

Feasibility Testing

Graduate students in the UVA Nursing program tested the feasibility of the application in terms of acceptability, demand, implementation, practicality, adaption, integration, expansion, and limited efficacy.

Acceptability: Acceptability assesses if the application is appropriate, suitable, and satisfying. When asked "Is the MoD app appropriate for measuring MoD?", 85% of participants answered, "very appropriate" and the remaining respondents answered, "somewhat appropriate." On a scale of 1 being not appropriate and 5 meaning very appropriate, the average response was 4.86 ± 0.35. When asked if the app is satisfying to use, all respondents answered "yes."

Demand: Demand assesses how often the application would be used. When asked how often they would use the application, 100% respondents answered, "I would use it as often as experiencing MoD" or "I would use it every once in a while." No respondents chose the options "I probably wouldn't use it very much," "I would never use it," or "I am not sure." When asked how likely they are to use the application daily in clinical practice on a scale of 1 (very unlikely) to 5 (extremely likely) the average response was 3.86 ± 1.12.

Implementation: Implementation assesses if the app is functioning as it should. 100% of respondents claimed that the app was easy to log-in to. Additionally, 100% of respondents answered that the app was "very
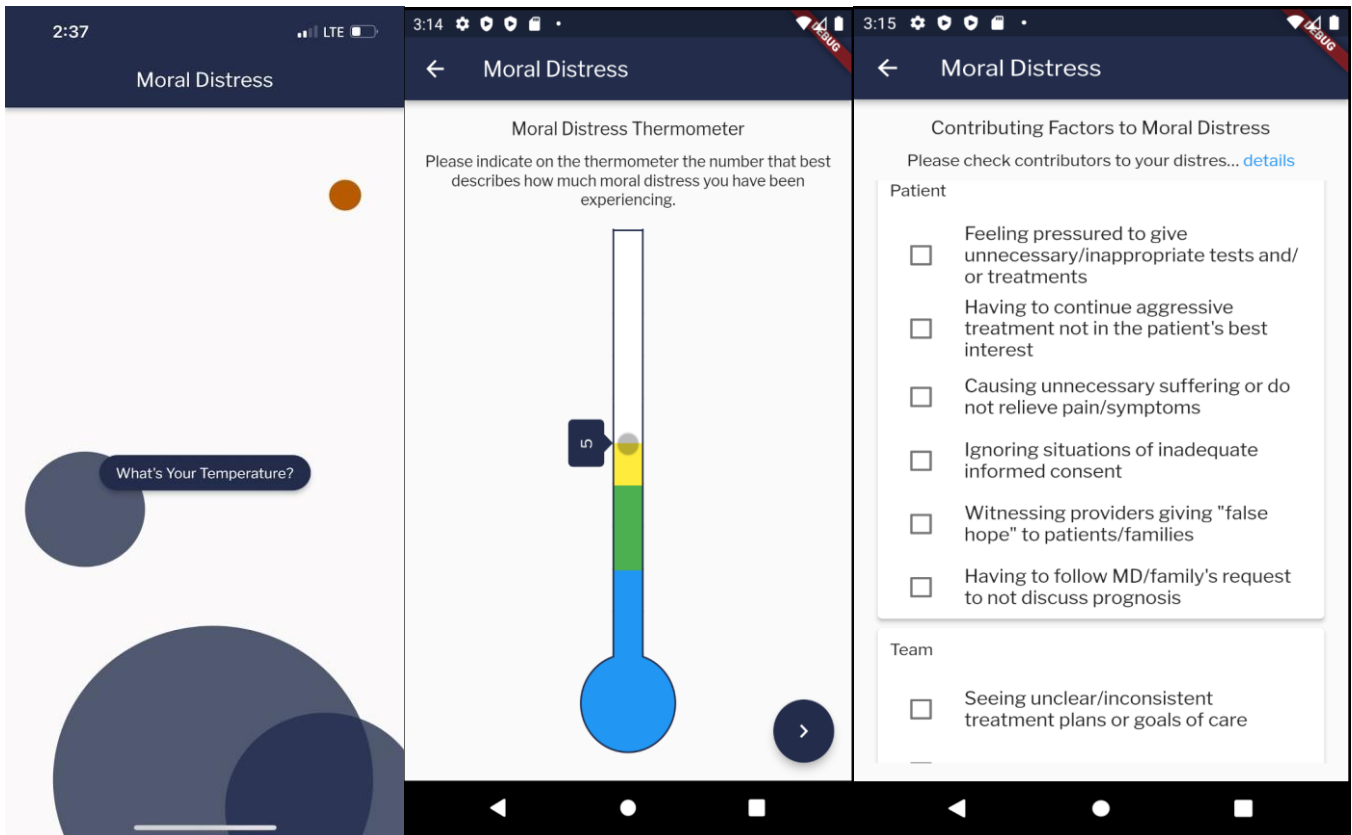
Fig. 2. Application Graphical User Interface. The graphical user interface displays what the user would see as they move through the application.

easy" or "somewhat easy" to navigate. When asked if they experienced any bugs with the app where it did not function as it should, three respondents answered "yes." The identified bugs included not being able to go back to a previous page, not including an "other" option, and having the screen go dark upon 30 seconds of inactivity.

Practicality: Practicality assesses how efficient the app is to use and the positive and negative effects for the user. The participants were asked to select benefits that occurred when using the app from a provided list and their responses can be seen in Figure 3. Potential benefits of the app identified by respondents include "felt my MoD score mattered," "felt my MoD score was being recorded," "felt I could more appropriately document my MoD score," "delt leadership was more aware of MoD since implementing the app," and "I discussed my MoD with a colleague." Additionally, the response "an outlet to voice frustrations" was submitted under the "other" category. The participants were also asked to select negative effects when using the app from a provided list and their responses can be seen in Figure 4. All but one participant answered, "none of these." One respondent answered, "it didn't matter if I recorded this or not."

Adaption: Adaption assesses if app updates are effective and helpful. In this feasibility testing, there is limited information on how adaptive the application can be because the updates and adjustments have yet to be implemented. When asked "If you were to indicate your MoD score was 3 or less than 3, would you want to indicate the cause?" 43% of respondents answered "yes" and 57% answered "maybe."

Integration: Integration assesses how well using the app fits into a typical day, especially when experiencing MoD. When asked how well they feel the app fits into their typical workday, 86% of respondents answered

"very well" or "somewhat well." The remaining respondent answered "neither well nor poorly. However, 57% of all respondents claim their answer to the previous question would change if they were actively experiencing MoD.

Expansion: Expansion assesses if the app fits with organizational or unit goals. 100% of respondents answered "somewhat agree" or "strongly agree" when asked if the app fits into the organizational goals of UVA Health, as well as when asked if the app fits into the organizational goals of their current role.

Limited efficacy: Limited efficacy assesses if the app shows promise of sustainability. 100% of respondents claimed they would use the app more if actively experiencing MoD. When asked if the app helped them better voice their concerns about MoD, 72% answered "strongly agree," 14% answered "somewhat agree," and 14% answered "somewhat disagree."

Discussion

As a result of this project, the successful creation of a mobile application that supports nurses during morally distressing events has been completed. The software combines a well-researched measurement system and associated survey questions which can accurately assess the level of MoD from a nurse or a nursing cohort. The program is downloadable on both iPhone and Android devices and can also be accessed through a web browser. This application is one that employs Amazon Web Services in order to store data in a consistent database that can be accessed by multiple parties. Similarly, upon data acquisitions, the
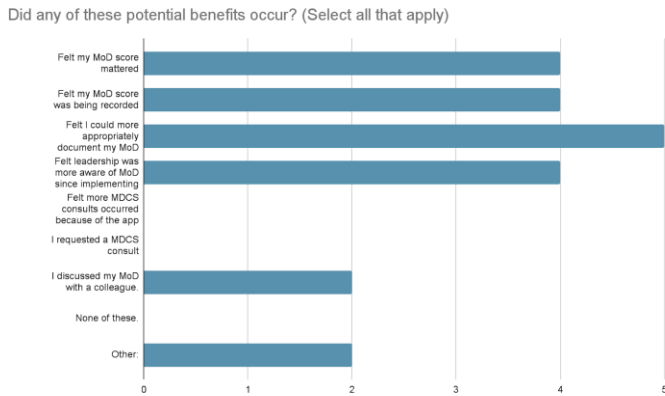
Did any of these potential benefits occur? (Select all that apply)

Did any of these negative effects occur? (Select all that apply)

Fig. 3. Positive User Effects Survey Question. The results from seven UVA Nursing graduate students when asked about the positive effects that occurred while using the moral distress application.

Fig. 4. Negative User Effects Survey Question. The results from seven UVA Nursing graduate students when asked about the negative effects that occurred while using the moral distress application.

current MDCS at UVA will be able to analyze the results and make decisions based on the needs for each unit of nurses. This is a novel pathway that is generated through the application which will be more accessible for nurses seeking to log MoD levels in real-time. Through limiting potential fears around reporting or stigma, nurses may be more likely to report cases of MoD. Nurses on shift often have little down time due to the fast-paced nature of a hospital. This limits their ability to seek help when they experience a situation in which they feel morally distressed. Using the app, nurses now have the ability to report real-time measures of MoD. The speed at which a new response can be generated allows them to report problems almost simultaneously as they occur. This not only ensures that nurses are able to submit a response but provides the MDCS and unit leaders with the most accurate data.

Due to timing conflictions with the lead software developer, the app was launched significantly later than was initially expected. Consequently, the timeline for fully integrating the MoD app with UVA MDCS was also delayed. Full experimentation within a sample of on-the-job nurses has been postponed but, using a smaller sample size of graduate nurses has supplied the team with data pertaining to 8 tenets of a successful app. The application was found to be satisfactory in the acceptability, implementation, practicality, and expansion subcategories of feasibility. Survey questions pertaining to these categories obtained a positive average response within the range of one standard deviation. The results of the survey questions pertaining to the subcategories, demand, integration, and limited efficacy are inconclusive. The average responses on these questions were positive, however large standard deviations prevent the team from drawing statistically significant conclusions. The large standard deviation is likely due to the small sample size, so continued testing with a larger sample size will provide more conclusive results. Limited conclusions could be drawn about the application in terms of adaptation because the initial testing did not have any updates to be assessed. To gain some understanding of adaption, the team included a question asking the participants their opinion on a potential feature to be added to the application. The update would not require the nurse to fill out the survey if their MoD score is less than or equal to three. However, the majority of participants answered that they would like to complete the survey regardless of how low their score is, suggesting the update should not be implemented. Through testing, some bugs were made apparent as well as potential changes to the UX. This information will act as a guide for further development in order to increase the validity of the software. Future testing regarding the UX should be completed, as well as constant adaptation throughout the lifetime of the app.
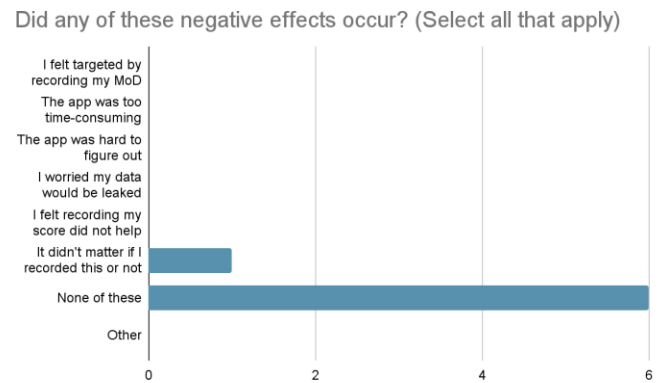
Limitations

There are several limitations that hampered the accuracy of the results. As stated above, the app was designed to be used during a shift right after or during an experience of MoD. Due to time constraints, testing has yet to be done with nurses who are on duty and exposed to a morally distressing situation. In addition, only seven participants, all nursing graduate students, undertook the questionnaire. The low sample size of a relatively homogenous population, who were all possibly familiar with the team member conducting the interviews, leads to untrustworthy statistics, problems concerning diversity of subjects, and the possibility of bias. Additionally, due to these limitations, the study provided no evidence towards the impact of the app's implementation on either the effects of MoD or the frequency of occurrences.

Next Steps

Feasibility testing with UVA Nursing graduate students will continue to obtain more accurate results from a larger sample. The team plans to test on 23 additional nurses, increasing the sample size from 7 to 30. Next, the team will implement any changes needed based off of the results from the feasibility testing. After the app has been updated, the next round of testing will be conducted in a hospital setting on ten UVA Health critical care nurses for continued assessment of feasibility and acceptability. Following additional updates to the application based on the results from the critical care nurses, the application will then be tested by CNSs and MDCS members within the UVA Health system. Interviews and focus groups will be conducted with these participants to understand the perspective of potential users and develop a threshold MoD score that indicates MDCS involvement. Final adjustments will then be made to the application before it is ideally deployed to the UVA Health system to be used by nurses. Continued research should take place to understand how well the application is integrated into the structure of the hospital and whether it is improving MoD intervention.

End Matter

Acknowledgments

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