

“Famcare: Mobile Application on Palliative Care for Filipino Caregivers”

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ABSTRACT

Caregiver at the palliative care not only benefits the client, but also the health care system (Selveira& Forman, 2019), and they should have access to high-quality, evidence-based interventions (Schulz, 2016). Moreover, Health care faces several challenges, such as funding limitations, large geographic distances that make such resources often more costly for rural patients. It is a general premise that information technology (IT) can address these challenges and enhance home health care services (Demiris, 2010). The main objective of this study is to develop a mobile app on palliative care in the android operating system for Filipino Caregivers. The researcher utilized the ADDIE framework or known as Analysis- Design- Develop, Implement, and evaluate to develop the mobile application:

The mobile application has the following features 1. With backward compatibility that can run with the minimum android OS of Ice cream sandwich 2. Palliative Care Awareness and Education. 3. List of Palliative care facilities and HIV treatment 4. With mobile utility medication manager, contact list, vital signs record, record manager, pain assessment. Two pilot test was done with the Caregiver end-user with a weighted mean of 3.73 or excellent and with the technical expert in IT with the weighted mean of 3.85 or excellent. The study recommended testing the effectiveness of the mobile app, translate to Filipino dialect, and enhance the feature, aesthetics of the mobile application.

INTRODUCTION

Caregiving is described as a natural process, something done partly out of love, but also out of a sense of duty and obligation (Henriksson, Carlander&Arestedt, 2013). The family usually puts patients' needs first; they might not be willing or find it easy to express their own needs, especially those who differ from the patients' (Wu, Che & Li, 2010). Being a family caregiver, it can pose significant physical, emotional, and social challenges, and the task is often challenging and draining. (Henriksson, Carlander, & Arestedt, 2013). Despite the need for high-level care, family members are often unprepared and unable to monitor the disease progression, unable to decide on treatment procedures, unprepared caregivers experiencing more serious adverse effects, like anxiety and mortality (Goldsmith & Ragan, 2017).

Family members, friends, and other paid or unpaid caregivers provide primary palliative care and considered as the spine for much of the care that is received by older adults and children (Henriksson & Arestedt, 2013; Reinhard, 2008 Institute of Medicine, 2008). Caregiver duties include, but are not limited to, critical symptom management, prognosis, care target discussion, advanced care preparation, and code status discussion and documentation (Quill & Abernethy, 2013), specific task care ranges from providing companionship and undertaking household tasks, through assisting in personal care and activities of daily living, performing complex physical (Schulz, 2016), and involved in convoluted medical decisions (Quill & Abernethy, 2013). Primary care at the end-of-life benefits not only the client but also the health system. At the end of life, more excellent continuity with primary care was associated with less avoidable hospitalizations, decrease emergency department utilization, and higher out-of-hospital death but many clients and family caregivers report feelings of neglect by nurse and physician at the time of death (Selveira&Forman, 2019).

Health care faces several challenges, such as funding limitations, vast geographic distances that make such resources often more costly for rural patients, and issues of clinical workforce distribution that impose access barriers to these services. It is a general premise that information technology (IT) can address these challenges and enhance home health care services. Advances in telecommunications, web solutions, mobile application and social networking tools have the potential to support health care delivery and education. The use of Information Technology can lead to a fundamental redesign of home care processes based on the purpose and integration of electronic communication. Caregivers should have access to high-quality, evidence-based interventions designed to mitigate or prevent adverse health effects (Schulz, 2016).

The main objective of the study is to develop a mobile application that will help Family caregivers in the Philippines caring for their love one with Palliative care condition. Richey and Klein (2005) suggested that this type of study undergo a structured phase. The study adheres to the steps of ADDIE model to develop the mobile app name FamCare for Android system for Family Caregiver. Analysis, Design, Develop Implement and each phase or stages employed a formative evaluation to ensure that errors in each phase are corrected and prevent problem in the future.

METHODOLOGY

According to Richey and Klein, (2005) developmental studies often are planned in phases a Type 1 developmental studies may have an analysis phase, design phase, a development phase, and a try-out and evaluation phase. Another organization of a Type 1 study would include phases directed toward first analysis, then prototype development and testing, and finally prototype revision and retesting.

The ADDIE model is the generic process traditionally used by instructional designers and training developers. The five phases—Analysis, Design, Development, Implementation, and Evaluation—represent a dynamic, flexible guideline for building practical training and performance support tools. (Instructional Design.org, 2019)

Two (2) palliative nurses and two (2) clinical instructor participated the one on one consultation and using and three mobile phone for follow up and clarification, that fit from the criteria in terms of experience (3 years and above) and for clinical instructor with Master's degree in Nursing, three consultation was done from May to July 2020 for the analysis phase of the study in relation to the contents and utilities of the Fam Care mobile application in android system. IT programmer/ developer is the expert in the designing and development of the mobile application in palliative care in collaboration with the researcher. IT programmer evaluates the program for functionality and smooth interface of the mobile app in the selected program for the android mobile platform. System developer have all the criteria set by the researcher. The IT specialist have a technical knowledge in developing a mobile application, with Master's degree in Information Technology

Purposive sampling using the snowball technique was employed in selecting the participants for the end-users as evaluators of the mobile software application in palliative care. Fifteen Caregivers were selected based on the following criteria

Data Gathering Procedure.

Understanding the end-user and their needs is the starting point of any design project may it be instruction design or mobile app development, this means observing and engaging with end-users in order to comprehend them on a mental and emotional level (Care foundry, 2019).

Analysis phase

The integrative review determines current knowledge about a specific topic because it is carried out to identify, analyze and synthesize results of independent studies on the same subject, thus contributing to a possible benefit on the quality of care delivered to patients. It is noted worth mentioning that the use of integrative review impacts not only in the development of policies, protocols, and procedures but also in a critical assessment that the daily practice demands.

Quality Score

#	Study	Quality Score
1	Ventura et.al (2014)	11/11
2	Silveira et.al (2012)	9/10
3	Galatsch et.al (2019)	8/8
4	Henriksson et.al (2013)	8/8
5	Hudson Aranda (2019)	10/11
6	Zimmerman et.al (2016)	9/13
7	Aoun et.al (2016)	10/10
8	Tarberg et.al (2019)	10/10
9	Uribe et.al (2019)	10/10
10	Armstrong et.al (2019)	10/10
11	Haapala, Carr, Biggs (2019)	10/10
12	Iyer et.al (2019)	10/10
13	Ghosh (2019)	10/10
14	Santo Lima et.al (2019)	10/10
15	Marcucci, et.al (2016)	10/10

Fifteen studies were compiled, organized by date retrieved from the search engine, using ProQuest, and were analyzed based on the inclusion criteria. The integrative review begins with the summary of findings and continues with an analysis of the data collected from the included studies. The data is examined, and the conclusion is drawn based on the pattern found in the literature. After the initial selection of the literature the researcher utilized Joanna Briggs Critical analysis tools to analyze the literature depends on the research design or methodology of the fifteen (15) literature. Twelve (12) out of 15 or eighty percent (80%) got a perfect score while the remaining three (3) the score less than the perfect score, but in an acceptable range in term.

Design

The second phase of the ADDIE model is the design phase in which the researcher needs collaboration from other experts in information technology and a programmer/ system developer for mobile application. In this phase, the design and the program that was utilized will be identified based from the intended user and the blueprint of what mobile app will look like for the third phase as well as the projection of expenses and budget of time and the backward compatibility. The design phase started from July to August 2019 where the researcher discusses to the system developer or the SME in Information technology the content of the mobile app and if the mobile app utilities are possible to include in the system of FamCare for the formative evaluation phase.

Development

The development phase is where the realization of the 2nd phase, where all the contents and design embedded in

the mobile application and evaluated by the developer and the researcher.

Implementation and Summative Evaluation

Implementation is the 4th phase in which pilot testing is done, and the end-user evaluated the said android application, after 2 weeks of testing the FamCare App, using the adapted and modified ISO 9126 software survey tool questionnaire for the following indicators such as Functionality, usability, reliability efficiency, maintainability and portability and content as a summative Evaluation. Mean and Frequency are the statistical treatment utilized in analyzing the result of the evaluation.

RESULT AND DISCUSSION

Analysis Phase

1st step Interview with the end user

The researcher interviewed five (5) end-users for possible content and utilities that are included in the mobile app. One-on-one interview via face-to-face interview and phone interview follow up for clarification and follow up question was done to ensure that all information is correct. During the interview, the end-user recommends medication reminders as one of the utilities of the mobile app that will alarm when the medication is due and facilities of care available in the Philippines.

2nd step Integrative Review Result Identified Themes

The focus of the integrative review was to identify the needs of the caregivers and the needs of the patient care in the areas of palliative care that will be included in the content of the mobile application. Four themes emerged from the data analysis that consists of the needs of the following, 1. Palliative Care Awareness and Education, 2. Continuity of Care, 3. Holistic Care 3, 4. Open communication to the palliative health care team.

Theme 1 Palliative Care Awareness and Education

Palliative Care awareness and education are defined as the needs of the family caregiver to access the right information of what is palliative care, prognosis., treatment to combat the misconception and stigma. Health Education is always part of the nursing responsibility in all areas, may it be in the community or the hospital or facilities, as imparting knowledge empower family and may result in the patient to have active participation in the whole process of treatment/ intervention of palliative care until the end.

Table 1 Coding Matrix for Palliative Care Awareness and Education

Author	Result/Excerpt	Codes and cluster	Themes
Zimmerman et al. (2016)	Participants in the intervention group emphasized the need for palliative care to be reframed and better explained by health care professionals, These perceptions provoked fear and avoidance, and often originated from interactions with health care professionals	Lack of awareness regarding PC PC education needs	
Uribe et al. (2019)	strengthen health and education policies Knowledge and information about the disease course	Need for palliative care education Information about the different treatment and modalities	

Armstrong et al. (2019)	Lack of family understanding, hospice view regarding the right to die, medication at the end of life, approaching end of life, the death experience, and activities that enhance end of life.	Lack of understanding about PC, Understanding of end-of-life activities such as Advance Care directives	Palliative Care Awareness and Education
Iyer et, al (2019)	Lack of knowledge about palliative care Illness understanding Prognostic awareness	Needs for information about PC treatment Understanding diseases Information about treatment	
Haapala & Biggs	Increase the level of awareness	Needs for PC awareness	
Santo Limo et al. (2019)	Health education within the health care service should be an instrument for valuing knowledge, not just transmitting the information.	Valuing PC education	

One theme that emerges from the data analysis is the palliative care awareness and education that was discussed by Silveira et al. (2012), Zimmerman et al. (2016), Hudson, P., & Aranda, S. (2014), Armstrong et al. (2019), Iyer et, al (2019). Lack of palliative care public awareness and education as stated by the different studies included in the literature are hindrances in accessing early palliative care (WHO, 2019), maybe due to the various factors such as misconception about palliative care; example given that palliative care is for cancer patient only (WHO, 2019), Negative attitudes and strong stigma or misconception on the said care (Zimmerman et al., 2016), lack of education and training of the health care professional (Pagulong, 2015), add to the Filipino culture of delayed seeking medical help (Aeur, Sarol Jr, Tanner and Weiss, 2001) and the attitude of “Bahala Na” when facing chronic illness (Stanford, 2019, Bigby, 2003; Mc Laughlin, 1998; Vance, 1995).

The study of Armstrong et al. (2019) discussed the lack of information about hospice care and how can it help, resulting in late referral and misconception of hospice care about hastening death. Ventura et al. (2014) and Uribe et al. (2019) cited that patient and caregivers wanted more information about the illness, often about managing their lives and making decisions, and how the condition would progress. Zimmerman et al. (2016) stated that paramount to early access and integration of palliative care is through strengthening health and palliative care education (Uribe et al., 2019), within and outside the health care service (Santo Lima et al. 2019) awareness of the palliative care program and facilities that cater to the individual needs under this care with the primary goal of increasing the quality of remaining time of the client.

Based on the first theme identified in integrative review “palliative care awareness and education,” the researcher includes the following content on the android system software; Definition and differentiation of Palliative care, end of life care, and hospice care. Breaking the myth of Palliative care, Dying with dignity, preparation for home-care. The android software is not meant to be the substitute of a palliative health care team such as the nurse and the doctor and avoid misuse of the system for self-diagnosis, but technology is one platform that a nurse can use to impart knowledge, increase understanding and awareness about palliative care, correct the misconceptions and encourage the family caregiver to consult a physician and early access to palliative care services and treatment.

Theme 2: Continuity of Care

Continuity of Care defined as the continuation of care from facilities or hospital to home setting as the family

becomes the primary care provider. This need for skills in assisting the client in meeting daily activities of daily living and symptom management at home.

Table 2 Coding Matrix for Continuity of Care

Author	Excerpt/Result	Codes	Themes
Silveira et al. (2012)	Continuity of care to help a patient make a treatment decision and plan for end-of-life care	Continuity of care	Continuity of Care
	Scheduling, flexibility, and time	Scheduling	
	Information sharing with outside providers and within primary care practices	Needs for information for care continuity	
	PCPs wanted to care for their dying patients and felt competent in end-of-life care	Needs for involvement of a family member	
	Coordination of care to address patient needs		
Tarberg et al. (2019)	Limited family involvement in all phases	Lack of PC involvement by family during the early phase	Family Involvement & Caregiver Skills
	Family caregivers wanted more information about practical issues for daily care	Caregiver skills	
	Caregivers wanted to be involved and feel able to provide palliative care effectively		
	Lack of follow-ups after the patient's death identified as a problem		
Uribe et al. (2019)	Advance care planning	Continuity of care understanding	Continuity of Care
		Advance care directive	
Ghosh (2019)	Distance from home to hospital is a problem	The problem is continuity of care due to location of Hospice Care Facilities	Access to Hospice Care
Santo Lima et al. (2019)	Recognition of family as a unit of care	Family as the primary care provider	Family as Primary Care Provider

The second theme that emerged from the data analysis is the need for continuity of care, cited by four studies namely Tarberg et al. (2019) Santo Lima et al. (2019) Ghosh (2019), Uribe et al. (2019). The paradigm shifts from family or loved one to primary caregivers who assist and meet the client’s activity of daily living and other needs. Family caregivers who provide home-based care may feel unprepared for the role and often neglect their own needs (Stajduhar & Davies, 2005; Talberg et al. 2019). Coordination of care was central in providing timely and robust end-of-life care.

Continuity of care also means gathering all the necessary information about the patient’s history, status, and prognosis, as well as arranging referrals to other providers, providing medications, and accessing community services (Ventura et al., 2014). Knowledge of the patient’s health status, ability to respond appropriately to patient and family needs, such as pain and emotional issues (Silveira et al., 2019) and knowledge and information about the essential care patient was cited by Uribe et al. (2019). Dela Vega et al. (2018) Family caregivers need

education, support, and supervision that empower them to tailor their care to the needs of the patient. The need to information to assist the client for practical skills in helping or attending their activities of daily living is also included in the system such as practical skills infection, giving oral medication, bed bath, exercise as well as some advanced skills that need proper training from the nurse such as NGT feeding among others was also included in the android content.

Added to the information within the system are the facilities in hospice care from the website of Hospice group of the Philippines official website with the name of the facilities/organization and their contact number and address or location and the HIV testing and treatment center by DOH based on the Department Memorandum no. 2018- 0031 for those patients who are willing to have an HIV test and wanted to avail of a free ARV medication. This information is crucial in the continuity of care for the patient who has needs and utilizes the resources within the community or at least the nearest facilities or treatment.

The android system includes utilities that may generate necessary health information about the client’s health. Among the utilities include the patient information sheet, vital signs reports, and pain assessment scale to ensure that day -to day information is kept within the system, and the health care provider in the community know necessary for medical and health intervention appropriate to the clients need. Medication reminder was also added to the utilities as part of the pain management system and continuity of care.

Theme 3 Holistic Care

Holistic care pertains to addressing the needs of the patient as a person, not just focusing on the physical facet but also attending the needs such as emotional, social, and spiritual needs.

Table 3 Coding Matrix for Holistic Care

Author	Result	Codes	Definition
Ventura et.al (2014)	Physical care needs were unmet, which indicates the examined palliative home delivering satisfactory care in this domain in other areas.	Physical needs	Holistic Care
Silveira et al. (2012)	emergent needs, provide emotional support,	Emotional needs	
Galatsch et al. (2019)	95.2% “pain/discomfort” to 20.8%, “family caregiver thought the patient was dead	pain as the common observation of family in cancer for PC.	
Henriksson, A., & Årestedt, K. (2013)	social support, place of care, time	Social needs	
Uribe (2019)	access barriers were: administrative, economic, cultural, knowledge, communication, institutional and geographical	Hindrance in access for PC.	
Ghosh (2019)	Several, physical, personal, emotional and social/financial. Holistic cancer	Holistic approach	

Table 3 studies that cluster under the holistic care. Palliative care as many studies shows that nurses and health care provider must not only focus on the symptom management and physical aspect but also address other human dimensions such as social, spiritual, emotional and financial needs of the client and the family caregiver.

The study of Galatsch et al. (2019) focus on the identification of physical symptoms experienced by the patient and observed by the Caregiver, this includes, severe pain, / discomfort, insomnia, vomiting, unable to eat or swallow, dehydration. Ventura et al. (2014) discussed some of the unmet needs of both family carers and patient,

as they are unable to attend and practice their religious belief, and mingle with friends due to fear of death and future event. Silveira et al. (2019) cited emotional and group support and counselling needs; the necessity to talk about their feeling about the situation. Study of Uribe et al. (2019) point out the need of the caregivers for emotional support to accept the disease and face each part of the process and financial support not only to cover the patient’s needs but also the caregiver needs when they become a full-time primary caregiver.

The android system includes holistic care as a response to the identified themes. Every patient has its unique needs and may not cover all the necessary information because of a vast body of knowledge about the said topic. Some information includes physical aspect of care needs comprise of basic symptom management, from pain assessment and pain control, non-pain management such as nutritional needs among others—stage of Grieving by dr. Ross was explained for emotional needs in each phase the client and the caregiver experience during this process and non-specified spiritual needs.

Theme 4: Open Communication

Open communication means constant contact with the health care provider, especially in times of need during home care delivery.

Table 4 Coding Matrix for Open Communication

Author	Result	Codes	Definition
Ventura et.al (2014)	effective communication with health-care professionals	Communication with a health care professional	Open Communication
Armstrong et al. (2019)	Lack of communication between health care teams and families	Communication needs between family and health care	
Silveira et al. (2012)	coordination of care	Coordination to the PC team	
Uribe (2019)	access barriers identified communication,	The barrier to access PC	

Regular communication with the palliative health care team lacks as cited by four authors. For both patients and caregivers, this may lead to anxiety as to who should be communicated in times of uncertainty (Ventura et al., 2019) resulted in the feeling of abandonment (Silveira et al. (2012). The concern with communication may lead to poor continuity of care (Ventura et al., 2019). Advances in telecommunications, web solutions, mobile application and social networking tools have the potential to support health care delivery and education. The use of Information Technology can lead to a fundamental redesign of home care processes based on the purpose and integration of electronic communication. Caregivers should have access to high-quality, evidence-based interventions designed to mitigate or prevent adverse health effects (Schulz, 2016). Open communication between the attending physician, patient, and family regarding the patient’s wishes in terms of treatment and end-of-life care appears to improve the dignified death as perceived by family caregivers based on the study of van Gennip et al. (2013)

In line with the themes, the researcher focusses on the use of technology within the capabilities of the mobile function, such as a list of contact for the health care team capable of calling health care providers. Journal and documentation of everyday activities, just like the nurse's notes in the patient chart.

Formative Evaluation Phase

According to the ADDIE framework, in every phase, there must be an evaluation at the end that will be carried out to the next stage. The researcher consulted four (4) Subject matter experts in palliative care; two are Filipino nurses who work in palliative care facilities here and abroad, and two (20 clinical Instructors. Face to face consultation was done with three or more meetings depends on the availability of the SME. The first meeting discussed the informed consent and the objective of the study. Once they are willing to be a subject matter expert,

they were given the topic and content based on the integrative review and ask for their suggestions and recommendation that need to add or omit in the content.

Content of the Mobile application for Filipino Caregivers

Based on the combined result of the integrative review and formative evaluation of the four SME in palliative care, the following are the list of content in palliative care that was included in the android system for Filipino Caregiver.

The content of palliative care software comes from the existing body of knowledge about palliative care from different sources. From printed books and online sources, articles, e-books, among others. Caregiver Booklet: A guide for a patient, family member and community caregivers by WHO (n.d), Palliative Care: Symptom management and end-of-life care: Integrated Management of Adolescent and Adult and Illness by WHO (2004), A Handbook of Palliative Care in Africa by African Palliative Care Association (2010) are the e-books that significantly contribute to the Palliative Awareness and Education, misconception and breaking the myth from the different website such as Medline (2019)

Caregivers' skills were a pattern to the book of Zucker's (2010) Essential book for Caregiver and Fundamental of Nursing by Kozier (2010). While Holistic Care in Psychological needs content comes from the book of Videbek (2017) Mental Health Nursing. The content of the book does not just copy the entire content of one source to another but need to consider many factors. The researcher considers the end-user some of the content especially content from the Nursing books and website are too technical or use medical jargon that only professionals can understand; that is why the content underwent an English critique to lessen this problem.

Design

Mobile app installation

Design is the process of planning and designing the system. Build a master plan that needs to follow to the next stage. The design is based on the first phase, which is the analysis phase, after identifying the content using the integrative review and the result from the formative evaluation. The researcher collaborates with the Information or system developer during the designing and developing stage. The designing period commences from June to July 2019. In this stage, budgeting and blueprint creation of the android application is part of this stage.

A virtual studio is a software of choice for the mobile application tool development. According to the system developer, the said software has the following advantage The backward compatibility was designed to cater to all android user's older version 2011 to present, especially caregivers who owned low end to high-end price android owner without having an issue of compatibility because of continuously updating of the android system.

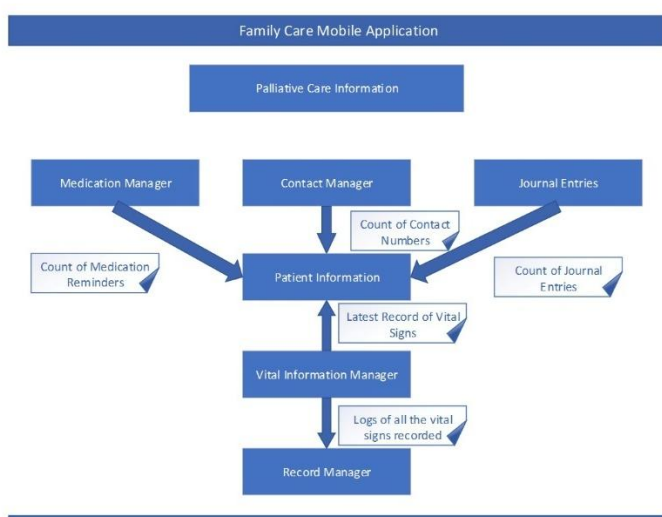


Figure 1 System Architecture of the mobile application Family Care

Figure 3 shows the architectural design of the whole system and how the android application work. The Home module or the patient information is the center of the android system as all the user input from the different module will reflect on the home module such as the name of the patient, number of medications reminder, number of journal entry, number of health care contact number and latest vital signs. The FamCare android system home was designed to ensure that the end-user and health care provider view all and most recent information of patients upon login.

The SME in palliative care expenses was amounting worth 3,00 pesos worth of gift and food expenses during the formative analysis phase. These expenses are the cost for the food and gift as the researcher use of time during the consultation. The original budget for the SME in palliative care is 7,000 for the professional fee and gift pesos, but only four experts were consulted out of five, while one SME is a religious figure who refuses to accept gift and payment while the rest refuse to accept cash payment.

Aesthetic Design

During the designing phase, the end-user recommended an interface that can easily understood and user- friendly with minimizing assistance or none at all from the developer. The FamCare Mobile app interface was designed to easily navigate the content and its utilities by positioning the list of topic and utilities at the left side corner of the mobile app. FamCare mobile app on the Android system was designed to be minimalist. According to Hunter (2020), A minimalist design is simple, easy to understand and only contains necessary elements to remove any complexity in the app Incorporating white space is also known as the negative space that does not have any colour. This blank space is essential for developing contrast, adding structure and focusing on the various design elements. FamCare background all over the mobile app may it be in the context of palliative care or utilities dominate white space background. this is why the FamCare mobile app uses minimal design to achieve this particular goal.

Development

```
apply plugin: 'com.android.application'

android {
    compileSdkVersion 29
    buildToolsVersion "29.0.0"
    defaultConfig {
        applicationId "com.example.famcarev2"
        minSdkVersion 15
        targetSdkVersion 29
        versionCode 1
        versionName "1.0"
        testInstrumentationRunner "androidx.test.runner.AndroidJUnitRunner"
    }
    buildTypes {
        release {
            minifyEnabled false
            proguardFiles getDefaultProguardFile('proguard-android-optimize.txt'), 'proguard-rules.pro'
        }
    }
}
```

Figure 2 Build. Gradle of the application

Figure above shows the build Gradle of the mobile app upon instalment. The minimum SDK version for the use is API 15 – Ice Cream Sandwich. This is based on a synced Gradle of the application. This means that the form is known to run on the minimum Android ICS. This build Gradle was used for technical evaluation during the formative evaluation. The mobile application on palliative care can run an operating system from Ice cream sandwich up to the latest Operating system of android.

Table 5 Mobile App Development progress

July		
		Selection of Android Studio to develop the application
		Gathering of Initial Content
		Design the initial application structure
		Design of the initial System Architecture
		Selection of icons and logos for the application
	ADDED:	Registration of account
	ADDED:	Login of a user
	ADDED:	Logout of a user
August		
	CHANGED:	Account Module (improve performance)
	ADDED:	Patient Information encoding
	ADDED:	Dashboard for Home
	ADDED:	Facilities for Care Item
	ADDED:	Journal Entries Item
	ADDED:	Sample facilities including hospitals
	ADDED:	Recording of the journal entry
	ADDED:	Home activity for the vital signs
	ADDED:	Palliative Diseases Item
	ADDED:	Viewing of Records Item
September		
	ADDED:	Additional functions in the Navigation Drawer
	ADDED:	Palliative Diseases – List View
	ADDED:	Symptoms Management Item
	ADDED:	Self-care and debriefing Item
	ADDED:	Connection of Patient Information to dashboard
	ADDED:	Contacts Item
	ADDED:	Contacts Information Recording
	ADDED:	Viewing of Contact Information
October		
	ADDED:	Caregiver Practical Skills Item
	ADDED:	Caregiver Advanced Skills Item

	ADDED:	Playback of voice recorded instruction
	ADDED:	Removal of Contact Information
	ADDED:	Call function for contact information
	ADDED:	Medication Reminder Item
	ADDED:	Symptoms Assessment Item
	ADDED:	Usage of seek bar for symptoms assessment
	ADDED:	Viewing of palliative diseases entries
	REMOVED:	Symptoms Management Item
November		
	ADDED:	Recording of medication reminder
	ADDED:	Viewing of medication reminder
	ADDED:	Vital Sign recording of blood oxygen
	ADDED:	Hospices for Care
	ADDED:	HIV Treatment Centers
	ADDED:	Palliative Care Introduction Item
	ADDED:	Symptoms Management Item
	CHANGED:	Connection of Medication Reminder to dashboard
	CHANGED:	Connection of Journal Entries to dashboard
	CHANGED:	Connection of Contact Information to dashboard
	CHANGED:	Symptoms Assessment to Pain Level
	CHANGED:	Recording of Blood Oxygen to Respiratory Rate
	REMOVED:	Facilities for Care initial content
	REMOVED:	Self-care and debriefing Item
	REMOVED:	Symptoms Assessment Item

Table 5 shows the mobile app development progress or in technical term the system change log or history of development stage from the selection of the program used for the android system up to the last content. The development process is iterative and putting the design into reality. The researcher and the system developer started working on the development phase from July to November of 2019, adding each component into the system, adding and removing the parts that are not working within the system. The researcher and the developer meet two to three times a month or depend upon the need to test the system from basic errors and mechanics of the system, other means of communication was also utilized for clarification such as SMS, e-mail for the technicalities on both Health care field and Information technology; such as inquiry about the system or the content of the palliative care. Examining the content is not flicking through it – it is a systematic check on the accuracy of the material and the utility of the navigation.

Implementation

Implementation commenced last December 10 – 17, 2019, with three IT experts and fifteen end-users. Pilot testing defined as a type of Software Testing that validates a component of the mobile app or the entire system

under a real-time working condition. It checks the primary functionality of the system before going into production. In Pilot testing, a carefully chosen group of end-users try the app under test and provide the feedback before the full deployment of the system. In other words, it means to conduct a rehearsal for the usability test that follows. Pilot Testing helps in the early detection of bugs in the System (Guru99, 2019).

Three experts in IT, test the android application in terms of Reliability, portability maintainability, and security using the modified MARS evaluation tool, while fifteen end-users were selected during the pilot testing of the android application in palliative care, purposive sampling and snowball technique were utilized in choosing the participants

Evaluation

Mobile application pilot test result from IT/technical expert

Table 6 Pilot test result from the technical expert/ IT

Criteria	Weighted mean	Verbal interpretation
Functionality		
The information is clear, concise and informative to the intended audience	4.00	Excellent
The modules are interconnected with each other and functions as a whole	3.67	Excellent
Functionality weighted mean	3.83	Excellent
Reliability		
The software is reliable in normal use	4.00	Excellent
Software is bug-free	4.00	Excellent
The system uses standard equipment that is reliable, widely available and applicable to a variety of uses	3.33	Excellent
Reliability weighted mean	3.77	Excellent
usability		
The software is easy to understand	4.00	Excellent
The software is easily operated by the intended user	4.00	Excellent
The program is attractive and interesting; it motivates users to continue using the program.	3.00	Good
Usability weighted mean	3.66	Excellent
Efficiency		
The program does not consume a large amount of memory that can slow down the processing of the system.	4.00	Excellent
Portability		
The effort required to install the system is minimal	4.00	Excellent
The program is usable on many devices with little	4.00	Excellent

or no modification		
The system can adapt to new specifications or operating environments.	4.00	Excellent
Portability	4.00	Excellent
General Weighted mean	3.85	Excellent

Table 6 shows the result of the pilot testing done by the three IT technical experts with the general weighted average of 3.85 with the verbal interpretation of excellent. Both Efficiency and Portability areas got the highest score of 4.00, or excellent while Usability got the lowest rating among the five areas with the score or 3.66 with the verbal interpretation of excellent.

The mobile app on palliative care has only 30 MB or 30,000 kilobytes size during the pilot testing and consume little space in terms of mobile memory consumption. According to pcloudy (2017), Android devices mostly run on phones with limited memory; a more significant memory consumption resulted in many leaks; the app runs out of available memory. This triggers more frequent Garbage Collector events that paralyze the device (Stop-the-world GC events) by almost stopping the rendering of UI and processing of events. This leads to an Out of Memory Exception and translates to the user as the app being unresponsive.

On the other hand, usability got the lowest score among the areas of pilot testing of the mobile application with the weighted mean of 3.66 with the verbal interpretation of excellent. The program is attractive and interesting; it motivates users to continue using the program got the 3.00 weighted mean and the lowest score among the question. The design of the mobile application approach is the minimalist design with a white background; this is to maintain the small memory consumption. The said result and recommendation were forwarded to the system developer to enhance the identified weakness of the app.

Summative Evaluation from the Caregiver end-user result

Table 7 Pilot test result from the Caregiver end user

Criteria	Weighted mean	Verbal Interpretation
Engagement		
Interest: The application can easily capture the interest of the user.	3.73	Excellent
Interactivity: Actions (click, scroll, etc.) within the app are responded by the application.	3.53	Excellent
Target Group: The app is well-suited to the selected respondents.	3.93	Excellent
Engagement weighted mean	3.73	Excellent
Functionality		
Performance: The application has no lag.	3.73	Excellent
Performance: There are no errors in the app	3.67	Excellent
Ease of Use: The application is easy to understand	3.80	Excellent
Navigation: Controls are easily seen and used	3.93	Excellent
Functionality weighted mean	3.78	Excellent
Aesthetics	3.62	Excellent

Layout: The placement of the controls and icons is well-thought of.	3.40	Excellent
Graphics: The icons and colour schemes are visually pleasing.	3.73	Excellent
Visual Appeal: The overall look of the app is good.	3.73	Excellent
Aesthetic weighted mean	3.62	Excellent
Information Quality	3.83	Excellent
It can provide useful information	3.87	Excellent
The information inside the app is accurate	3.80	Excellent
Information quality	3.83	Excellent
GWA	3.73	Excellent

Table 7 shows the result of the pilot test for the mobile app on palliative care evaluate by the family caregiver or the end-user, with an overall weighted mean of 3.73 with the verbal interpretation of “Excellent” based on the weighted scale range. Among the MARS evaluation tool, the areas of Information Quality got the highest weighted mean of 3.83 with the verbal interpretation of excellent. The content of the mobile application about palliative care awareness and education is the identified need during the integrative review in the analysis stage. Palliative care Application (app) can pave the way for promoting the patients’ knowledge and thus cultivating their quality of life, which, in turn, can deliver proper care at the end of the patients’ life (Salimian et al., 2019).

Aesthetic got the lowest weighted mean among the areas with a score of 3.62 with a verbal interpretation of “excellent”. Adding graphics, choosing colours and deciding on fonts has a significant bearing on how engaging the course content is. The careful selection of these elements allows presenting the content in a manner that will appeal to the intended user (Strizver, 2019; Quigley, 2019). Question about the Layout: The placement of the controls and icons are well-thought-of got the weighted mean of 3.40 with a verbal interpretation of “excellent” and one of the recommendations of the end-user is to add back button function to return to the previous module or dashboard for easy access rather than use the main interface to access other parts of the system. he said recommendation will be included at the final version of the mobile application.

DISCUSSION

The aim of the study is to develop a mobile application on android devices with backward compatibility specifically designed for Filipino Caregiver caring for their love ones or relative with Palliative condition. The researcher adhered to the structured process of ADDIE model. Analysis, Design, Develop and Evaluate that follow the characteristics of developmental research design.to develop an output intended to the end user need.

During analysis phase fifteen literature were included in an integrative review to extract the identified needs of the caregiver in Palliative Care. One on one interview with five (5) Caregivers were conducted for their suggestion and recommendation in terms of the information and utilities that were included within the mobile app. Four nursing experts in palliative care were consulted for the evaluation of the analysis phase.

The design stage is where the author collaborated with SME IT experts to design the mobile app based from the drawn conclusion in the previous phase. Architectural design was done during this phase and became the blueprint of the next stage which is the Development stage. It is where the developer and the researcher created a prototype mobile app that will run in any android device. A total of 11 tests were done to evaluate the system for any errors and lags from July to December 2019 before the pilot test.

Purposive sampling was used to select the end user during the implementation stage. Fifteen (15) Caregivers and three (3) IT experts participated during implementation for a week last December 2019, and evaluated the said output using the Modified and adapted MARS based from the ISO 9126 known as Software Quality

characteristics. The result of the evaluation of the technical expert has a GWA of 3.85 while the end-users have a GWA of 3.73. A total of 30 megabytes or 30,000 kilobytes is the file size of the mobile app upon download in APK format ready to install the system for android smartphone devices only. Four themes emerged from the data analysis during integrative review that consists of the needs of the caregiver, 1. Palliative Care Awareness and Education, 2. Continuity of Care, 3. Holistic Care, 4. Open communication to the palliative health care team. Interviewed with the caregiver suggest the need of the following utilities vital signs monitoring, record keeping, pain management, medication reminder.

A virtual studio is computer software of choice by the system developer for its functionality and backward compatibility during the design and develops stage of the mobile application known as FamCare. Aesthetic, expenses, target end-user time and file size are the factors considered to shift the output from hybrid mobile app to mobile app dedicated for android mobile devices user only as the one limitation of the mobile app

Pilot test was done last December 2019 with a total of seven days or 1 week from December 1- December 17 with fifteen caregiver and three technical experts in Information technology is considered necessary and mandatory. Modified and adapted survey was utilized using MARS (Mobile App Rating Scale) with verbal interpretation of excellent in both end user. Improvement was done to the mobile app based from lowest score such as Usability, Aesthetic and add other features based from the comments and suggestion of the end – user and was included in the final output such as back button and easy navigation, End- user Agreement for the protection of the end-user and the developer.

Mobile app can be a potent alternative for caregivers of patients on palliative care as reference for caregiving knowledge and skills as well as a tool for documentation used and available for both the caregiver and the health care Team attending to the patient. The app has the potential for upgrade and updates

The study recommended the following based from the result of the study such as 1. Strengthen the palliative awareness program in the community. 2. Make known the available resources for palliative care program. 3. Increase social support and group support for palliative care. 4 Translate the content from a different dialect in the Philippines such as Tagalog, Cebuano, Ilocano. 5. Additional content in the holistic care that discusses culturally sensitive care for Filipino people, 6. Test for the quasi-experimental studies to measure the effectiveness of the mobile application system 7. Enhance the aesthetic and layout or overall design and background of the mobile application to enhance learner engagement on the mobile app. 8. Include the suggestion and recommendation in terms of more content, usability, utilities in the final version of the mobile app. 9. Expand the palliative care awareness and education content that focuses on children and last develop a hybrid application that can run on both IOS and Android OS smartphones that will cater to all smartphone users.

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Educational Background

PhD in Nursing Education major in Leadership and Management

St. Paul University Manila

May 2020

Master of Arts in Nursing Major in Nursing Administration

The Philippine Women's University

June 2016

Bachelor of Science in Nursing

Luna Goco Colleges

2005

Highschool

Abada College

1997

Elementary

Sta Rita Elementary School

1994

National Licensure Examination/Eligibility

Type Of License	License Number	Year Of Registration	Expiry Date
PRC	0379624	16	05/14/2018

Qualification Certification

Type Of Certificate	Certificate Number	Year Of Registration	Expiry Date
Caregiving Nc Ii	19042102002532	12	April 14, 2024
Trainer Methodology I For Caregiving Nc Ii	TMC- 190421010000051	5 YEARS	April 14, 2024
National Tech- Voc Tvet Certificate I For Caregiving Nc Ii	Ongoing renewal	Five years	

Research And Publication (for the last five years Only.)

Title	Year Completed/Published
Death And Dying: The Nurse Experience	“The Blaze” Volume 2 November 2016
“Kaleidoscope: A Glimpse in The Psychiatric Nurse Experience During Conduction (Co-Author)	2017

Professional Organization

Professional Organization	Affiliation
Philippine Nurse Association	Member
Aqra	Member
Cavite Technical- Vocation Educators Association Inc. (Ctvea)	District Vii Representative/

Community Services (for the last five years Only)

Date	Title Of Community Outreach Project/Activity	Venue
September 2017	Infant Nutrition	San Jose Tagaytay
August 2017	Breastfeeding part 2	San Jose Tagaytay
August 2017	Breast Feeding part 1	San Jose Tagaytay
July 2017	Pregnancy Nutrition	San Jose Tagaytay
September 2016	Annual Blood Letting	Olivarez College Tagaytay Gymnasium
June 2016	Health Campaign on Dengue	Brgy. San Jose Tagaytay

Achievement And Awards

Date	Achievements/Awards	Venue
April 2018	Best in Research for Healthcare sector	Olivarez College Paranaque

Personal Information

Date of Birth : May 14, 1981

Religion : Roman Catholic

Nationality : Filipino

Civil Status : Single

Heights :5’7”

Talents : Singing

Hobbies : Reading books and listening to Audiobook