

Conference Paper

E-Sakto: Lowering the Cardiovascular Risk of Patients with Hypertension and Diabetes through Public-Private Partnership

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Abstract

Background: Technologically-enabled “whole-of-society” upgrading of a Rural Health Unit (RHU-Samboan) in data collection & records management, and determining the Cardiovascular risk score (CVD-RS) of patients with hypertension (\pm diabetes) was the aim of the e-Sakto program. **Methodology:** A descriptive study with four components: e-Sakto Sukod (right measurements), e-Sakto Suwat (right recording), e-Sakto Sibya (right information), and e-Sakto Serbisyo (right service). Samboan, a fifth-class municipality in Cebu, Philippines, is the pilot site. For data collection, this study used SHINE OS+ Electronic Medical Records (EMR) provided by SMART Communications, Inc. through public-private partnership (PPP). Furthermore, WHO WPR-B CVD-Risk Score was used to monitor the effect of using EMRs in relation to patients’ 10-year cardiovascular risks. **Results:** A competency check revealed that all health staff were adept at taking vital signs while only 59% (38/65) of health volunteers were competent. An inventory of the equipment revealed that 4 out of 15 barangays (villages) had appropriate tools for vital signs measurement. A municipal resolution institutionalized the use of EMR and linked Samboan with higher health institutions for referrals. Out of the total 414 hypertensive patients, 106 subjects underwent 3 monitoring visits. This resulted to a statistically-significant lowering of their 10-year cardiovascular risk score using the 3- and 5- point scoring CVD risk scale ($p = 0.041$; $p = 0.001$). **Conclusion:** e-Sakto made sure that the health workers were competent; equipment needed were available; EMR was institutionalized; and linkages were formed. The use of EMRs in monitoring hypertensive patients result in significant reduction of their 10-year CVD risk.

Keywords: WHO Cardiovascular Risk Score, Data Privacy Protocol, Diabetes Mellitus, Electronic Medical Records (EMR), Hypertension, Package of Essential Non-communicable (PEN) Disease Interventions

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1. Introduction

Sustained hypertension is a major risk factor for cardiovascular disease, more so when coupled with diabetes [1]. The World Health Assembly created a three-fold strategy to prevent and control non-communicable diseases (NCDs). Pinlac, et al. noted that the last leg of the triad, surveillance, is crucial in that it provides the compelling evidence for appropriate action against NCDs [2]. While ASEAN countries have made good progress toward the World Health Organization's (WHO) concept of Universal Health Care (UHC), there is an existing data gap on the ASEAN coverage of services related to NCDs [3]. The Department of Health (DOH) has led programs like the Philippine Package of Essential Non-communicable (PhilPEN) Disease Interventions to fight NCDs and resulted in the decreased prevalence of hypertension over the last 5 years. However, they noted that the prevalence of behavioral risk factors remain high, and the Philippines needs to accelerate whole-of-society and whole-of-government (multi-sectoral) actions to attain success. Statistical reports in the Philippines show that since 1986, diseases of the heart consistently emerged as the top 1 cause of mortality in the Philippines, ahead of communicable diseases such as pneumonia. Morbidity statistics also show that hypertension has risen to the second place in the past years. Regional statistics in Central Visayas however, did not reflect this data [2],[4]-[6]. In far flung municipalities in Central Visayas, specifically in Samboan, Cebu, health information was only derived from a record of symptoms erroneously labelled as "diseases". The competence of the staff and volunteers was questioned. There were no individual patient records. The health information system was not in place. Thus, there was no reliable data on the real status or burden of diseases in the area.

Health Information is one of the six building blocks of UHC. Currently, Electronic Medical Records (EMRs) enjoy widespread subscription in countries such as Canada, USA, EU, and even Ethiopia. Clinics in Canada believed that their perceived time savings and improved patient record-keeping had improved the quality of proactive and preventive care and patient safety by providing more complete and legible information. The common message that emerged was that no clinic would return to paper-based charts after experiencing the benefits of EMR [7]-[9]. In 2014, the Philippines launched the eHealth Strategic Framework Plan with the essential underpinning of creating the Philippine Health Information Exchange (PHIE) - Health Information Highway by 2020. This will serve as a platform where different EMRs, health facilities and government agencies can communicate and interoperate. Soon, we can access medical records, retrieve laboratory results online – allowing for faster referrals between healthcare providers

and significantly improve healthcare service among Service Delivery Networks (SDN) [10]. However, the dominant form of EMR in the country is still characterized by small to medium scale implementation from both government and various sector groups that are independent of each other. Most of these initiatives such as CHITS, iClinicSys, WAH, and SegRHIS among others are focused on surveys and data collection, health promotion and community mobilization [11]. The PHIE remains to be a dream for the Philippine health system.

This health information disparity needs to be “made right” (*isakto* in the Visayan Dialect) in order to ensure the production, analysis, dissemination & use of reliable and timely information on health determinants, health systems performance and health status of citizens. By focusing on the establishment of individual patient records or electronic medical records and ultimately using the records to detect and control hypertension, this study thereby addresses the data gap on NCDs in the Philippines. Institutionalizing this type of health information system will ensure that the data management system will be sustained. Secured Health Information Network and Exchange (SHINE) OS+ EMR may be the key in making the PHIE a reality.

1.1. Objectives of the study

The aim of the e-Sakto program was to undergo a technologically-enabled, “whole-of-society” approach in upgrading a Rural Health Unit (RHU-Samboan) in terms of data collection & records management, and determining the 10-year Cardiovascular (CVD) Risk Score of patients with hypertension (\pm diabetes). Furthermore, e-Sakto checked whether monitoring of patients lowered their 10-year risk of a fatal or non-fatal cardiovascular event.

2. Methodology

2.1. Ethical considerations

A Data Privacy Protocol for Municipal Health Offices, the first of its kind in the Philippines, was developed to protect patients’ confidentiality. This was based on the Data Privacy Act of 2012 [12]. Patients’ data were encoded in the EMR, upon their consent. Paper-based records were maintained as back-up files. Health staff, volunteers, and partners who had access to the medical records were made to sign a confidentiality clause/agreement.

2.2. Study population and patient selection

This was a descriptive study which addressed the need for proper data collection & records management in the care of patients and determining the cardiovascular risk score of patients with hypertension (\pm diabetes) through the e-Sakto program, with its four components, namely: e-Sakto Sukod (right measurements), e-Sakto Suwat (right recording), e-Sakto Sibya (right information), and e-Sakto Serbisyo (right service).

2.3. Locale of the study

The study was conducted in Samboan Rural Health Unit (RHU) (Facility Code 2032), Samboan, a 5th class municipality in the southern part of Cebu Island, Philippines, located 150km away from Cebu City (coordinates 9°32'N 123°18'E). Its total land area is 45.16 km², divided into 15 barangays (villages), with a population of 20,884 according to the National Statistics Authority Census of 2015 [13]- [15].

2.4. Patient selection / unit of study

The study enlisted hypertensive patients in the locality who underwent consultation at the Samboan RHU starting on October 2015. The study ran for 8 months. A review of the medical records from SHINE OS+ EMR was used to identify subjects.

Inclusion criteria include adult patients who had elevated BP (systolic BP [SBP] ≥ 140 mm Hg or diastolic BP [DBP] ≥ 90 mm Hg; abbreviated $\geq 140/90$ mm Hg) at the 2 most recent primary care visits in Samboan RHU. Patients taking anti-hypertensive drugs were also identified as hypertensives. This group of patients were enlisted into the study and baseline BP readings were taken. Patients who were pregnant, took non-Compact medications, had stage 4 or 5 kidney disease, acute coronary syndrome, coronary revascularization, or stroke within past 3 months or those with New York Heart Association class III or IV heart failure or known left ventricular ejection fraction $< 30\%$ were excluded from the study.

2.5. Study maneuver

e-Sakto piloted the process of standardizing the competency of health workers and volunteers. Installing and institutionalizing the use of SHINE OS+ EMR in the data collection, early detection and control of hypertension formed part of this technologically-enabled upgrade. It also checked whether monitoring lowered 10-year risk of fatal or non-fatal cardiovascular events among hypertensive patients (Figure 1).

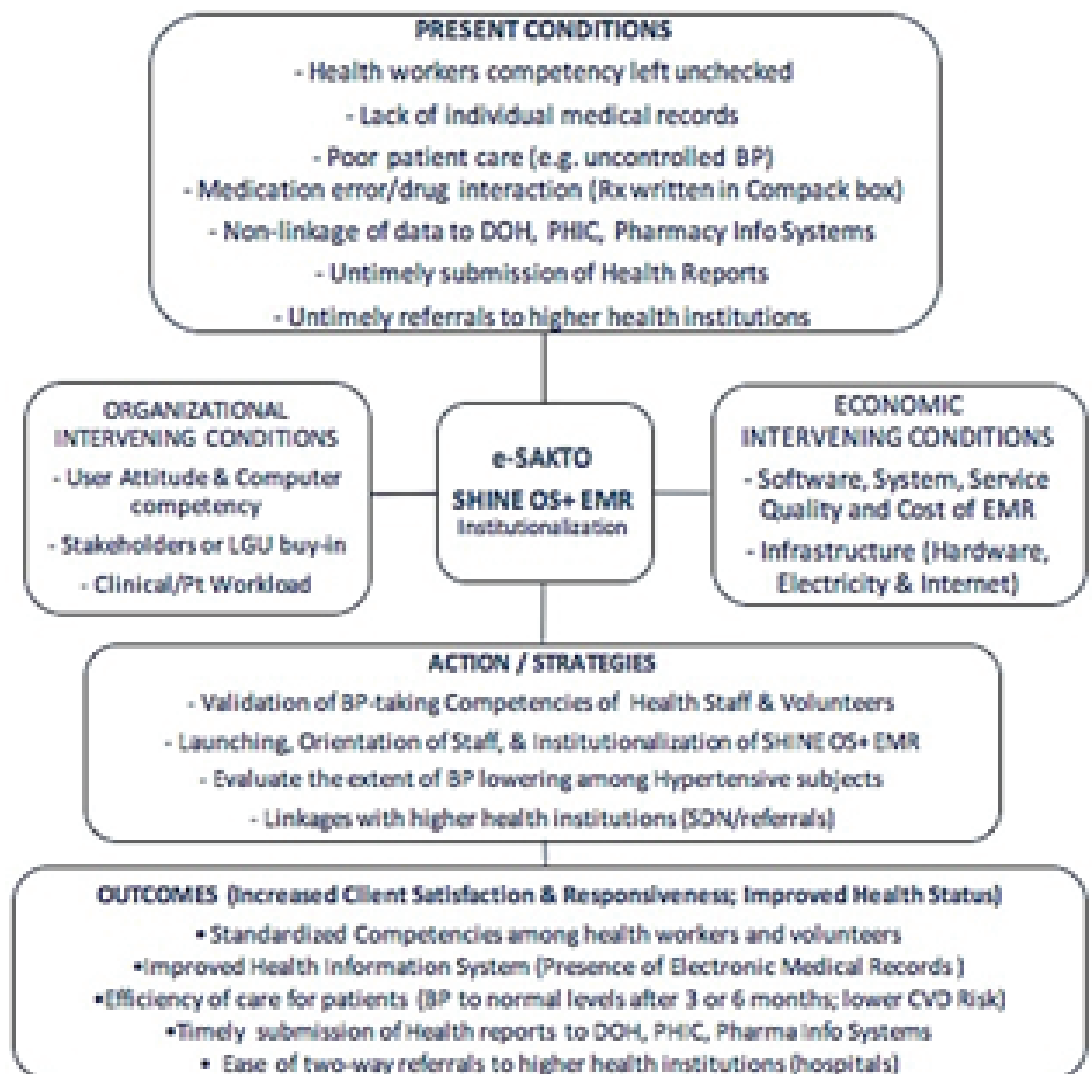


Figure 1: Conceptual Framework for e-Sakto SHINE OS+ (adapted: Gebre-Marian, 2010).

2.6. e-Sakto Sukod (Right measurements)

The competence of health staff and volunteers involved in early detection & control of hypertension were checked & confirmed through a baseline e-Sakto Competency Check. A battery of pre- and post- tests, return demonstrations, and lectures were used to standardize the competencies of the said workers in terms of taking vital signs, weight, and height. These competencies were certified by the Municipal Health Office and DOH- Provincial Health Office. The pre- & post-tests were based on the Participant Knowledge Test developed by Horswill in 2010 [16].

Barangay Health Workers (BHW) & Nurse Deployment Program (NDP) treatment partners were assigned to the subjects for BP measurement at 0-, 3-, and 6- month intervals. This rigorous approach fast-tracked the monitoring & control of hypertension among the subjects. An inventory of all available tools, equipment, or facilities currently being used for data collection (BP set, thermometer, computers) was done.

2.7. e-Sakto Suwat (Right recording)

This component explored the existing methods/tools of data collection used for NCDs/ hypertension. A MOA was signed between Samboan and SMART Communications, Inc. where SHINE OS+ was provided by SMART Communications for free, as part of their Corporate Social Responsibility (CSR). SHINE OS+ EMR was installed in all available computers and laptops in Samboan RHU on September 30, 2015.

Institutionalization of SHINE OS+ as official records management tool in the Samboan RHU was done through a municipal resolution. Samboan RHU partnered with the local college, Cebu Technological University (CTU) - Samboan branch, in the installation and networking of various computer units into the SHINE OS+ system. IT students from CTU were tapped to encode patient records into the system. Samboan RHU formed a partnership through a MOA with two health institutions, namely: Cebu Neuroscience Society (CNS), and Vicente Sotto Memorial Medical Center (VSMCC) to extend its Service Delivery Network (SDN).

2.8. e-Sakto Sibya (Right information)

The Rural Health Physician underwent continuing medical education for NCDs through Philippine Heart Center (PHC)-SANOFI's PRIME Academy for Hypertension Management and Institute of Studies in Diabetes Foundation's (ISDF)- LEAD PH Advanced

Course in Diabetes Care. Two of the nurses were also sponsored by Samboan RHU to undergo training as Diabetes Nurse Educators (DNEs) in ISDF.

Community Health Clubs were organized in all 15 barangays in Samboan, supervised by the physician and DNEs. This was a venue for patient monitoring, distribution of free antihypertensive DOH-Compact medications, zumba, and NCD & nutrition-related lectures. Community-wide lectures on hypertension and diabetes were conducted to various high risk sectors (senior citizens, teachers, LGU employees).

2.9. e-Sakto Serbisyo (Right service)

The result of EMR application in monitoring hypertensive patients' reduction of their 10-year CVD risk was assessed. Data from SHINE OS+ was extracted and evaluated using the WHO/ISH risk prediction chart. This chart indicates 10-year risk of a fatal or nonfatal major cardiovascular event such as myocardial infarction or stroke. Risk is stratified according to age, sex, blood pressure, smoking status, and presence or absence of type 2 diabetes mellitus for 14 WHO epidemiological sub-regions. The Philippines belongs to the Western Pacific Region B (WPR-B) sub-region. Risk Levels may be classified using either a 3-point or 5-point scoring scale. The 3-point scale is either mild (green, <20%), moderate (orange, 20 to <30%), or high (red, >30%) risk. The 5-point scale is more specific in determining risk levels into low (green, <10%), mild (yellow, 10 to <20%), moderate (orange, 20 to <30%), high (orange-red, 30 to <40%) and very high (red, >40%) (Figure 2) [17]-[18].

2.10. Statistical analysis

A simple 10-point pre- & post- test and return demo competency check was utilized to standardize the skills of health workers in taking vital signs. Frequency tables were used to analyze the extent of workers who passed the competency check. Comparison of the changes in BP was done using the Friedman's Chi-square test for related samples through SPSS version 23 (IBM) with level of significance set at 5%.

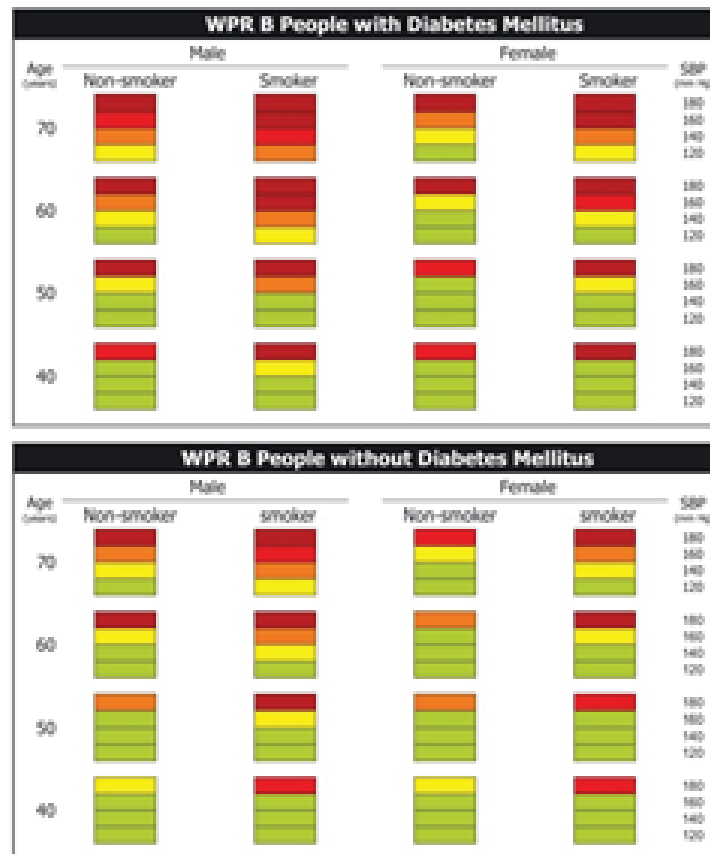
3. Results and Discussion

3.1. e-Sakto Sukod

WHO/ISH Risk Prediction Chart

WHO/ISH risk prediction chart for WPR B. 10-year risk of a fatal or non-fatal cardiovascular event by gender, age, systolic blood pressure, smoking status and presence or absence of diabetes mellitus.

Risk Level ■ <10% ■ 10% to <20% ■ 20% to <30% ■ 30% to <40% ■ ≥40%



Risk levels
 The colour of the cell indicates the 10-year risk of combined myocardial infarction and stroke risk (fatal and non-fatal) as shown below
 10-year combined myocardial infarction and stroke risk (fatal and non-fatal)

Figure 2: WHO/ISH Risk Prediction Chart in hypertensive patients - Western Pacific Region B (WPR-B).

3.2. Competency among health workers & volunteers

A Competency Check with a short pre- & post- test and return demonstration activities was conducted among the 14 health staff (6 midwives, 8 NDP nurses), and 65 health volunteers on September 2015. Results of the initial competency check found that 100% or all 14 health staff were adept at taking vital signs. However, 27 out of 65 (41%) health volunteers did not know how to properly take vital signs, specifically, taking a BP measurement. (Figure 3).

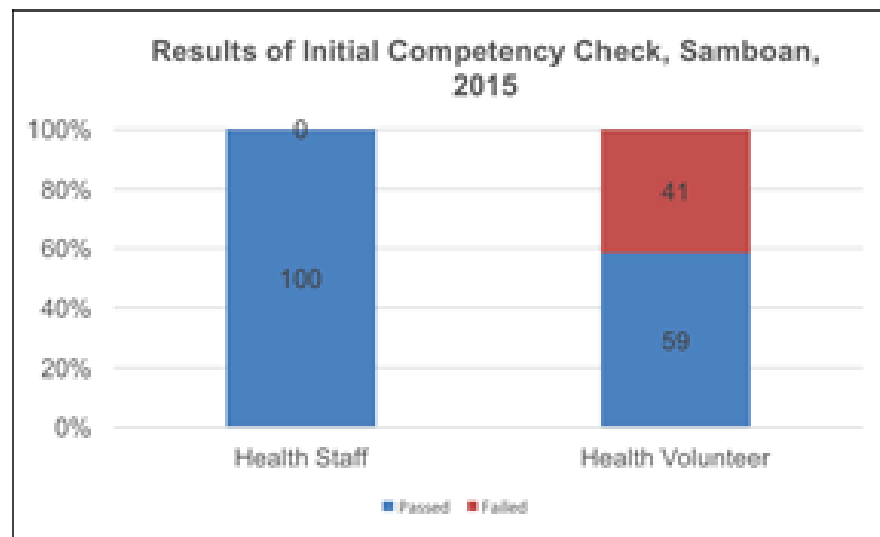


Figure 3: Results of Initial Competency Check among Health workers, Samboan RHU, 2015.

Almost half of the health volunteers were not equipped with adequate skills to perform their basic functions. Unlike countries like Singapore where some centers already started a program where vital signs, and blood sugar are taken by patients using state-of-the-art equipment and data is sent to the hospital's database instantaneously via bluetooth, the Philippines is still very dependent on human resources for health in manually measuring vital signs. [19] It is imperative that they hone these skills. The health staff, led by the doctor and public health nurse, retrained the entire health team with a series of lectures, return demonstrations, and a post-test. At the end of the post-test, all staff members and volunteers passed (>70% post-test score).

3.3. Inventory of tools & equipment for data collection (Vital signs)

The inventory revealed that only 4 out of 15 barangays had functioning blood pressure (BP) sets, while only 3 had functioning thermometers. The Samboan RHU & birthing center had 3 BP sets and 3 digital thermometers. There was one computer set and 1 functioning typewriter but no internet connection for Samboan RHU. The

Based on these findings, the Samboan LGU addressed the problem by approving additional budget for acquiring new medical equipment (manual BP sets & thermometers for all barangays). In addition, DOH Tsekap Program also eased the problem by distributing digital BPs and contact-free thermometers for all 15 Barangays. Computer hardware concerns were resolved through purchasing new laptops by Samboan LGU. Three laptops were also donated by SMART. Communication problem was solved through internet subscription.

Installation of SHINE OS+ EMR in all available computers and laptops in Samboan RHU and the formal launching of SHINE OS+ in Samboan occurred last September 30, 2015. Samboan Health staff were trained by members of the SMART-AJWCC team on how to operate SHINE OS+.

3.4. e-Sakto Suwat (Right recording)

3.5. Institutionalizing SMART SHINE OS+ EMR system

The need for a strengthened Health Information System in the improvement of health-care services in Samboan was apparent. The author presented this concern to the Local Chief Executive & Sangguniang Bayan so that concrete actions can be done. The concept of having an EMR through SHINE OS+ was met with excitement. The Sangguniang Bayan (SB) members were supportive and quick to authorize the mayor to sign a Memorandum of Agreement with SMART Communications and to partner with the local college, Cebu Technological University- Samboan branch, in the installation and networking of various computer units into the SHINE OS+ system. Information Technology students from CTU were tapped to encode patient records into the system. The students & RHU staff were made to sign a Confidentiality Commitment to protect patients' data privacy. Within two weeks, eight to ten students working at least 8 hours per day were able to encode over 5000 individual health records. This enabled Samboan RHU to leapfrog from having no health recording system to having an advanced, fully-functional system that is available both online and offline.

Samboan SB Resolution No. 2015-097 on the use of SHINE OS+ EMR was approved to institutionalize the improvements in the Health Information System. The next step was to form a linkage with higher health institutions in order for Samboan RHU to send patient referrals through the SHINE OS+ system. Samboan signed a MOA with Vicente Sotto Memorial Medical Center (VSMMC; a 1,200-bed DOH-retained tertiary hospital in Cebu City) and the Cebu Neuroscience Society (CNS) to forge a two-way referral system and establish continued partnership with these institutions. The study also took a turn as Samboan was invited to present its experience with SHINE OS+ among different groups in order to expand its Service Delivery Network. Consequently, the author was able to present the e-Sakto Samboan-SHINE Experience to the League of Municipalities of the Philippines (Cebu Chapter- Municipal Mayors), Technical Working Committee – DOH Region VII, Association of Municipal Health Officers in the Philippines (AMHOP;

Annual Convention 2015), and was even featured on Bloomberg TV (Business Matters episode 8).

3.6. e-Sakto Sibya (Right information)

Monthly Community Health Club attendance has grown over the months, with an average of 40 patients for each barangay. Attendance was encouraged since the provision of free Compack medications were given during these monthly meetings. In addition, free laboratory tests were given during health clubs. In the RHU, all patients who are > 25 years old were screened for hypertension. This approach at monitoring is achievable in the public health setting with the help of the entire Samboan Health team and its partner organizations.

3.7. e-Sakto Serbisyo (Right service) Monitoring Hypertension Management

Monitoring Hypertension Management

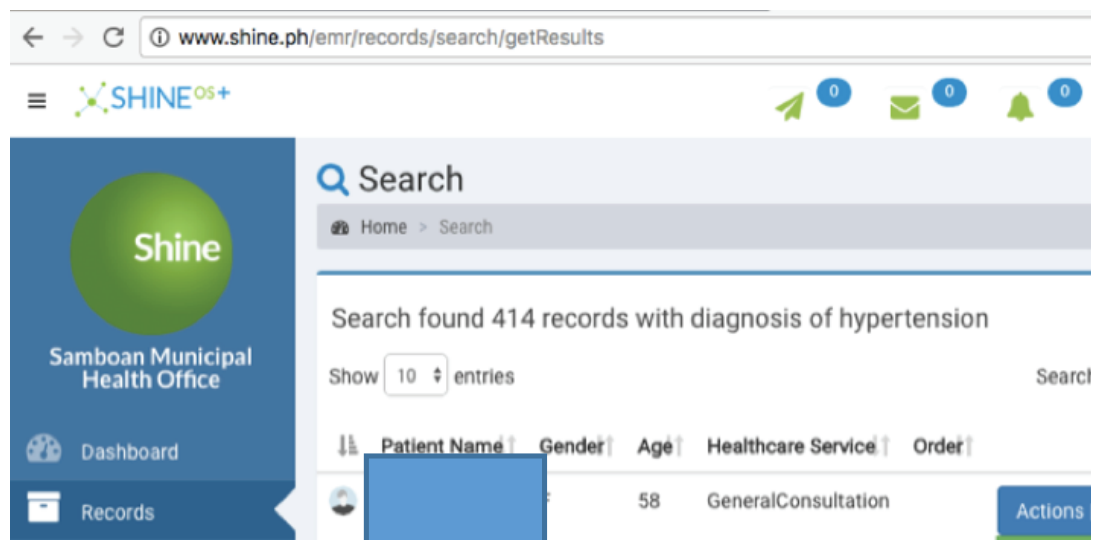


Figure 4: SHINE OS+ search result for “hypertension,” Samboan, Cebu, (July) 2016.

The total number of hypertensive patients in the SHINE OS+ EMR system of Samboan RHU reached 414 as of July 2016 (Figure 4).

Out of 414 patients encoded in SHINE OS EMR, 106 were included in the study. The mean age was 59 years old, predominantly female; 79% (84/106). Among the subjects, 8 had both hypertension and diabetes while the other 98 had hypertension only.

There were 4 smokers in the group. Most of these patients were on calcium channel blockers (CCB; amlodipine) while others were given angiotensin receptor blockers (ARB; losartan), or both, through the free DOH-Compack medication program.

The distribution of subjects under 3-point scoring initially classified them into mild, moderate, and high risk of 10-year CVD events and were 91, 8, and 7 respectively. Initial 5-point scoring into low, mild, moderate, high, and very high risk were 72, 19, 8, 4, and 3 respectively. Khanal, et al. conducted a study that estimated the total 10-year CVD risk using the WHO/ISH Risk Prediction Chart (SEA-R) among the rural population in Nepal. Similar to e-Sakto, they gathered subjects whose average age were 54, and also predominantly female. They found that a large proportion of Nepalese rural population is at moderate and high CVD risk. [20] In this e-Sakto study, using the WPR-B chart, we found that the initial risk levels were mostly mild to moderate in the Philippines. e-Sakto went a little bit further than the Nepalese study in that it monitored the subjects' level of CVD risks 3 and 6 months after the initial enrollment. Results in both 3- and 5-point scoring in lowering the 10 year CVD risk were found to be statistically significant ($p = 0.041$; $p = 0.001$) (Table 1). This indicates that the e-Sakto intervention with the use of SHINE OS+ EMR may lower incidence of heart attacks or fatal cardiovascular events among patients with hypertension.

TABLE 1: Friedman's chi square on 3-time observation in hypertension management monitoring at Samboan, Cebu, 2016.

	Friedman's Chi-square	df	p-value
3 point scoring	6.408	2	0.041
5 point scoring	33.340	2	0.001

4. Conclusion

e-Sakto made sure that the health workers were competent; equipment needed were available; EMR was institutionalized and linkages were formed. The use of EMRs in monitoring hypertensive patients result in significant reduction of their 10-year CVD risk.

5. Recommendations

The whole-of-society approach is successful only upon full support of the local officials and the health team. LGU officials and partners should be kept informed of the latest updates of the program through quarterly Local Health Board meetings - to win over their trust & interest. Politicians need visual interpretation of health care data and these can be presented at a glance with the use of EMR.

Partnering with the academe will bring much-needed manpower to be able to encode your records in an efficient & cost-effective manner. Many companies and organizations are willing to help LGUs and make PPPs a reality. However, it lies upon the proponents to do the legwork of reaching out to companies/ showing them areas where they can be of help.

The author recommends that the use of EMRs, with the capability to send e-referrals to other health institutions and partner agencies, be mandatory among all municipal health offices. This will address the data gap in all DOH public health programs. This, in turn, will increased Client Satisfaction & Responsiveness; and ultimately lead to better health status.

Each year, at least one Competency Check should be done so that the volunteers' skills will be strengthened and new volunteers can also learn proper vital signs-taking. RHU staff will also be given further opportunities for continued medical education (Nutrition, hypertension & diabetes nurse education, PhilPen) so that they will be the ones to run the program on a long-term basis.

Author's Note

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References

- [1] Abu-Saad, K., A. Chetrit, S. Eilat-Adar, G. Alpert, A. Atamna, M. Gillon-Keren, O. Rogowski, A. Ziv, and O. Kalter-Leibovici. 2014. Blood Pressure Level and Hypertension Awareness and Control Differ by Marital Status, Sex, and Ethnicity: A Population-Based Study. *American Journal of Hypertension* 27(12).
- [2] Pinlac, P., E. Castillo, J. Guevarra, I. Escartin, M.E. Caluag, C. Granada, L. Tagunicar, A. Banda, J.J. Go, J.K. Kim, C.A. Sy, A. Maceda and N. Gloriani. 2015. The Status of Non-Communicable Disease Prevention and Control in the Philippines: A Systematic Review. *Acta Med Philippina*, Vol. 49 No. 3, pp 19-26.
- [3] Van Minh, H., N. Pocock, N. Chaiyakunapruk, C. Chhorvann, H. Duc, P. Hanvoravongchai, J. Lim, D. Lucero-Prisno III, N. Ng, N. Phaholyothin, A. Phonvisay, K.M. Soe, and V. Sychareun. 2015. Progress toward universal health coverage in ASEAN. *Glob Health Action*.8:10.3402.
- [4] Margolis, K., S. Asche, A. Bergdall, S. Dehmer, S. Groen, H. Kadrmas, T. Kerby, K. Klotzle, M. Maciosek, R. Michels, P. O'Connor, R. Pritchard, J. Sekenski, J. SperlHillen,N. Trower. 2013. Effect of Home Blood Pressure Telemonitoring and Pharmacist Management on Blood Pressure Control: A Cluster Randomized Clinical Trial. *JAMA*;310(1):4656.
- [5] Department of Health - Health Statistics. 2013. Causes of Morbidity & Mortality. (www.doh.gov.ph/node/198.html) retrieved September 2015.
- [6] Administrative Order No. 2012-0029: Guidelines in the institutionalization of the Philippine package of NCD (PhilPEN) interventions in the management of hypertension and diabetes in the primary health care. Manila, Department of Health, 2015.
- [7] Ledikwe, J., J. Grignon, R. Lebelonyane, S. Ludick, E. Matshediso, B. Sento, A. Sharma and B. Semo. 2014. Improving the quality of health information: a qualitative assessment of data management and reporting systems in Botswana. *Health Research Policy and Systems*, 12:7
- [8] Paterson, G., N. Shaw, A. Grant, K. Leonard, E. Delisle, S. Mitchell, M. McCarrey, B. Pascal, N. Kraetschmer. 2010. Conceptual Framework for Analyzing How Canadian Physicians Are Using EMR in Clinical Care. *Studies in health technology and informatics* 160(Pt 1):141-5.

- [9] Gebre-Mariam, M., E. Borycki, A. Kushniruk, and M.E. Purkis. 2012. An Electronic Medical Record (EMR) Implementation Framework for HIV Care and Treatment Facilities in Ethiopia. *Electronic Healthcare*, Vol. 11 No. 1 pp14-24.
- [10] SMART Shine OS+ Software. 2015. (<http://www.shine.ph/>), retrieved Sept 2015.
- [11] Ona, E. 2014. National Telehealth CHITS 10th Anniversary, Keynote speech. (<https://telehealth.ph/2014/09/16/doh-sec-enrique-onas-keynote-speech-at-chits10-celebration-and-research-forum/>), retrieved September 2015.
- [12] Data Privacy Act. 2012. R.A. 10173 An Act Protecting Individual Personal Information In Information & Communications Systems In The Government & The Private Sector, Creating For This Purpose A National Privacy Commission, And For Other Purposes. (<http://www.gov.ph/2012/08/15/republic-act-no-10173>), retrieved June 2016.
- [13] Samboan Health Facility Code. 2015. Samboan RHU Health Facility Code "2032". National Health Facility Registry website. (<http://nhfr.doh.gov.ph/rfacilities2list.php?t=rfacilities2&psearch=samboan&btsubmit=&psearchtype=%3D>), retrieved Sept 2015.
- [14] Samboan Demographics. 2015. Samboan, Cebu. (<http://en.wikipedia.org/wiki/Samboan,Cebu>), retrieved September 2015.
- [15] National Statistics Authority. 2015. Samboan, Cebu. (<https://psa.gov.ph/content/samboan-cebu>), retrieved June 2016.
- [16] Horswill, M., M. Preece, A. Hill, M. Watson. 2010. Detecting abnormal vital signs on six observation charts: An experimental comparison. Australian Commission on Safety & Quality in Healthcare. (<http://www.safetyandquality.gov.au/wp-content/uploads/2012/01/35983-DetectingAVS.pdf>)
- [17] Package of Essential Non-communicable (PEN) disease interventions for primary health care in low-resourced settings. Geneva, World Health Organization, 2010. (http://www.who.int/nmh/publications/essential_ncd_interventions_lr_settings.pdf), retrieved September 2015.
- [18] Martinez, R., R. Quintana, J. J. Go, M.S. Villones and M. A. Marquez. 2015. Use of the WHO Package of Essential Noncommunicable Disease Interventions after Typhoon Haiyan. *Western Pacific Surveillance and Response Journal*, 6 (Suppl 1):18–20.
- [19] Ling, Z. 2017. Various Applications of Telehealth and Monitoring at National University Hospital Singapore. Plenary lecture presented at the Singapore Prevention & Cardiac Rehabilitation Conference, Singapore.
- [20] Khanal, M., M.S.A. Ahmed, M. Moniruzzaman, P.Banik, R.R. Dhungana, P. Bhandari, S. Devkota, and A. Shayami. 2017. Total Cardiovascular Risk for Next 10 Years Among

Rural Population of Nepal Using WHO/ISH Risk Prediction Chart. BMC Res Notes
10:120