# Nurse-led Telemonitoring Clinic using
## iCARDEA An Intelligent Platform for Personalized Remote Monitoring of CIED Patients

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## Introduction

The amounts of CIED devices that have been implanted since 2008 have grown exponentially, resulting in increasing numbers of patient visits in already overcrowded clinics. Accessing patient medical records to obtain up-to-date information in a timely manner to provide safe and efficient treatment can be a slow process as medical records are often located in many separate areas with access restrictions. New methods need to be created that are safe and efficient to help alleviate the burden on health care services. Introducing telemonitoring with adaptable, computer-interpretable and evidence based clinical guideline models can be a viable option for a busy clinic, utilizing the nursing staff to assess and evaluate the alerts and reports being sent from the CIED devices.
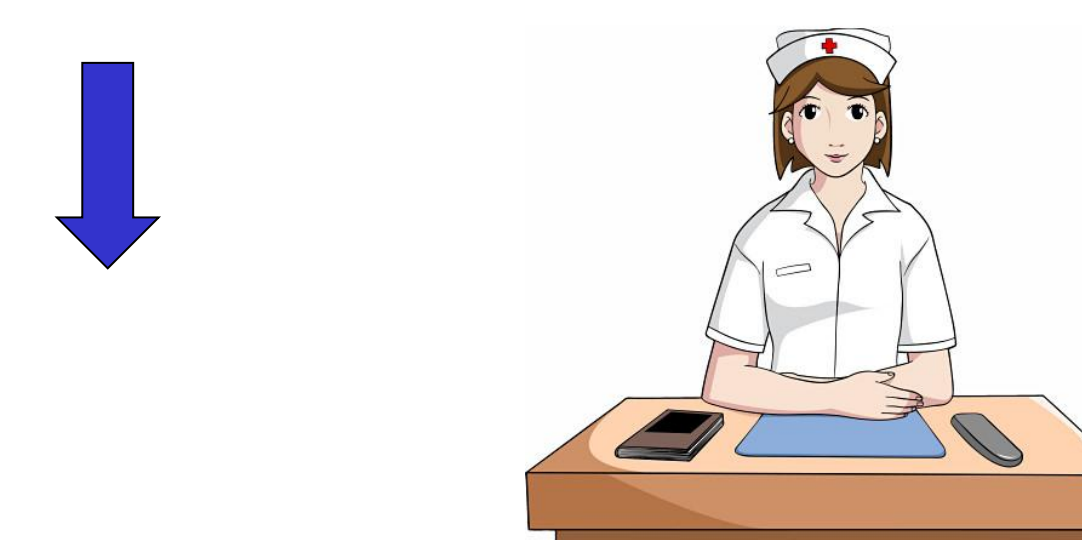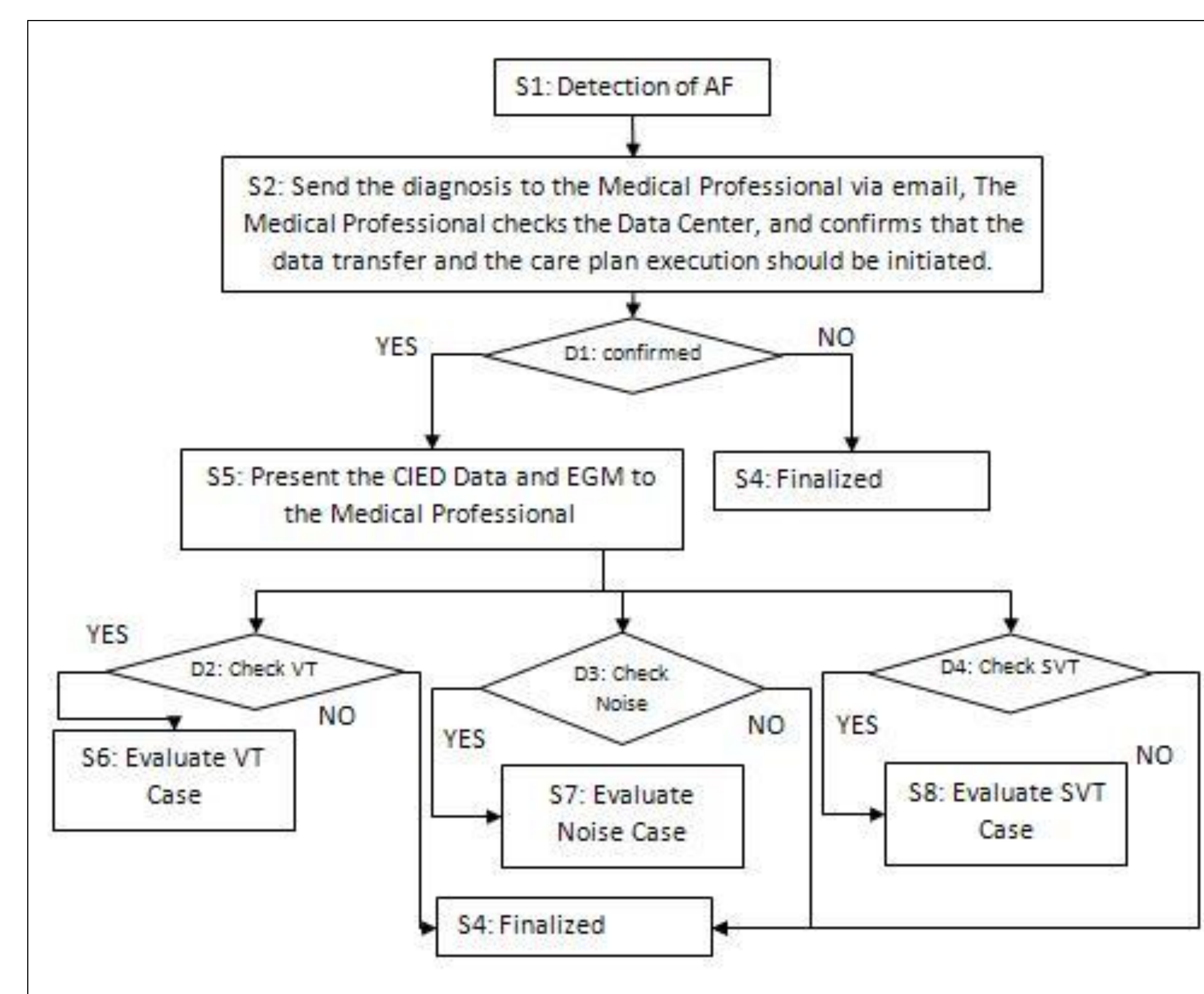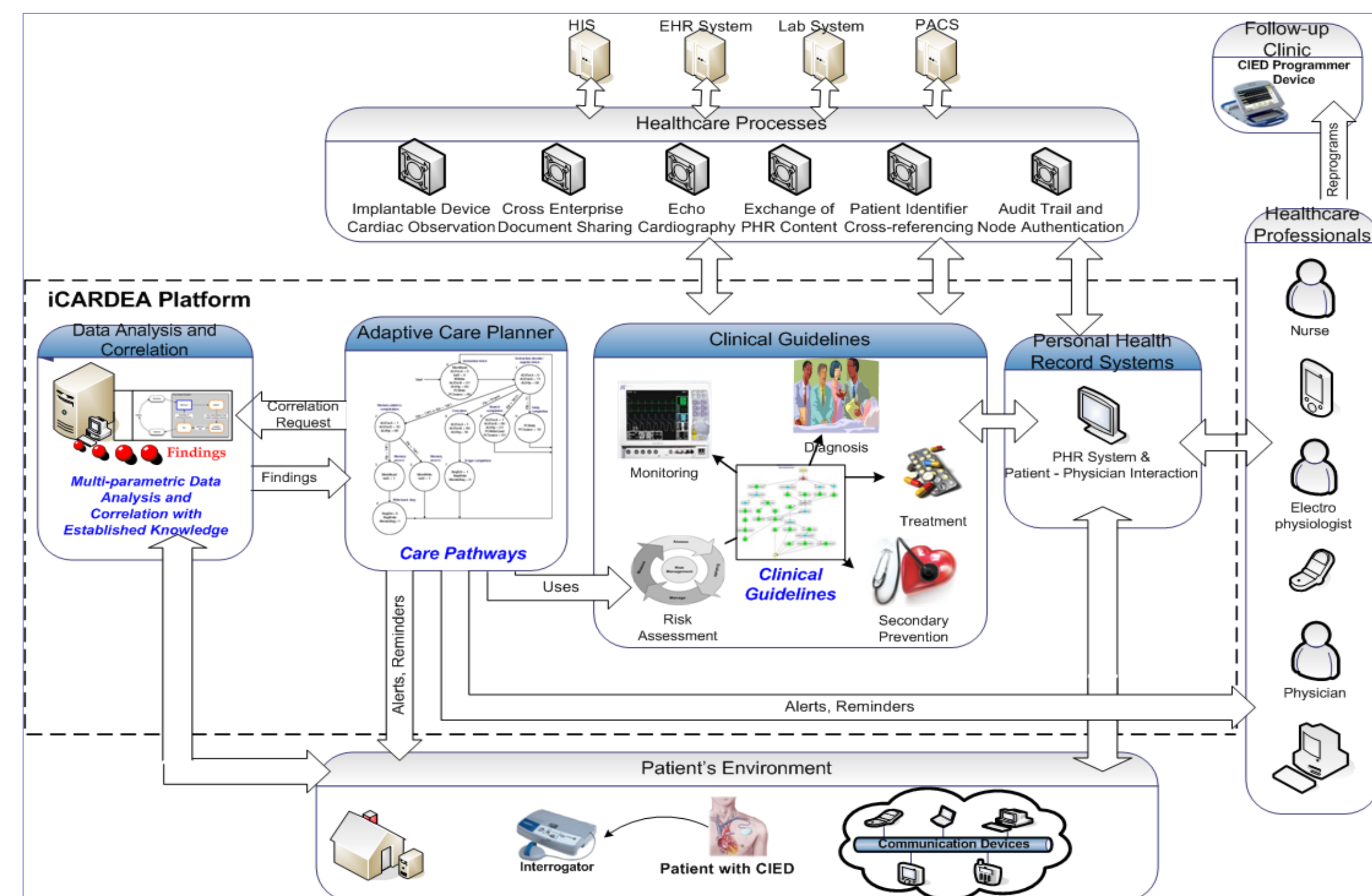
## Methods

Using standard interfaces exposed data from a patient's CIED, electronic health care record (EHR) and patient health care record (PHR) are collected and then correlated. The data are converted to HL7 Clinical Document Architecture (CDA) format to interface with the iCARDEA system. Using state-of-the art data analysis techniques, patient-specific warnings and suggestions will be automatically generated enhancing the data presented. An adaptive CarePlanner applying guidelines and risk assessment will generate alarms. The CarePlanner will be activated whenever an event is detected. An integrated patient health care record (PHR) allows the patient a communication portal between themselves and various health care personnel, providing an up to date status of the patient. The nurse is responsible for evaluating the information received from all sources including recommendations from the iCARDEA CarePlanner. A cardiologist will be contacted when medical intervention is needed. The nurse is also responsible for the telemonitoring logistics and management.

## Results

At present, careplans have been developed for atrial fibrillation and ventricular tachycardia, as well as for potential technical problems. The nurse activates the CarePlanner whenever an event is detected. The steps for careplan execution are then provided, and a link is given for a graphic monitoring tool providing a work flow that allows the results of each step in the decision process to be visible including the retrieved data from the EHRs (medications, lab results, etc.). For every step in the decision process the PHR and EHR will be accessed by the iCARDEA interfaces which reduces the time the staff needs to accumulate various medical information. After a recommendation is presented different options are provided, such as guidance on prescription of medications, doses, and possible side effects.

## Conclusion

iCARDEA provides quick access to important medical records, supports treatment decisions; and assists the nurse in making sure that the CIED patient is being cared for according to the current clinical guidelines. It will also help facilitate the early detection of events allowing for a timely treatment of the patient. The decrease in clinic visits will decrease the burden on the patient and health care system. A pilot study is planned once all the system's components are completed.

iCARDEA aims to advance the state-of-the art in CIED patient follow-up through clinical guidelines, integrating EHRs, and promoting the use of PHRs in a patient empowerment framework.
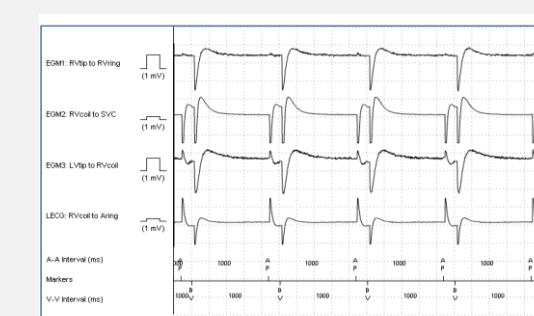




Patient Name: Andreas Schmidt
Patient ID: 12345667
Initial Diagnosis: Sudden Death (Access to EHR)
Implanted Device: A dual chamber St Jude Current excel DR with serial number 525113
Last Follow-up Date: February 02, 2010 (Access to previous Remote follow-up results)

Received: March 22, 2011, 15:47
Alarms Detected: Atrial Fibrillation at a rate of 180
(Access to Report Exported)                    Assessments by CIED

EGM: (Access to Report Exported)

Is Sinus Tachycardia observed: Can not be assessed by CIED, please check the EGM

Is Real SVT detected: NO

Is AF observed: YES

Please choose among these cases:

| Continue with Sinus Tachycardia Case | Continue with Real SVT Case | Continue with AF Case |