WHITE PAPER

On

EFFICACY OF iMMi LIFE SYSTEM AS A FACILITATOR OF QUICK & RELIABLE DETECTION OF HEART ATTACKS

iMMi Life

A Cardiologist Network that Never Sleeps.

iMMi Life Healthcare facilitates quick & reliable detection of heart attacks

Background

In India with less than 4000 cardiologists and 1200 cardiac surgeons as many as 10 lakh potential cardiac events happen per month[1-9]. With over 8 lakh physicians in the country and 80,000 medium-sized hospitals, 4 to 6 times the number of hospital admits for heart attack are potentially unserved/underserved. Annual admits for heart attack is about 30 lakh patients in India[10-13].

Our country witnesses four heart attack deaths every minute, and these occur mainly in the 30 to 50 age group[14]. 50% of heart attack sufferers die just because they are unable the reach a hospital in time[15]. Lack of awareness combined with nil/limited cardiologist cover in the easy-to-reach neighborhood hospital/nursing home hikes the mortality rates.

Delay between symptom onset and definitive treatment[16-19]

Nature of delay		Description	Probable causes
Pre-hospital delay	Decision time or patient delay	Interval between onset of symptoms and the patient's decision to seek help	− Failure to recognise a heart attack − Atypical symptoms (occur in over a third of threatened heart attacks)
	Transport time	Interval between seeking help & arrival at the emergency department (ED)	Traffic
Hospital delay		Interval between ED arrival & definitive treatment (door-to-needle time for thrombolytic therapy or door-to-balloon time for percutaneous coronary intervention)	− Lack in cardiac expertise − Clinical connectivity gap between attending physician & cardiologist

With the current 'healthcare delivery' methodology, when a person experiences symptoms of an impending heart attack, the average duration between symptom onset and treatment is nearly 300 to 360 minutes and this marks a huge delay in saving lives[20]. According to the National interventional council of Cardiological Society (CSI) of India the average door to balloon time is > 80 minutes (2011 statistics from CSI states it is just 48.6 minutes)[21]. This excellent time economy fails to see a downfall in death rates owing to the delay in 'symptom to door' metric.

A chronological report on 'Symptom to hospital' and 'door to needle &/or balloon' time in the treatment of acute myocardial infarction

	India			Other countries		
Year	Symptom to hospital time	Door to needle time	Year	Symptom to hospital time	Door to needle time	Door to balloon time
1972[22]	24 hours to 7 days	Not mentioned				
1981[23]	4 hours & 55 minutes	Not mentioned				
1990[24]	Not mentioned	210 ± 64 minutes				
1997[25]	330 minutes	30 (17–100) minutes				
2003[26]	8.5 ± 0.8 hours	1.2 ± 0.1 hours	2002[31]	170 minutes	40 minutes	Not mentioned
2004[27]	10.8 ± 12.4 hours	Not mentioned	2004[32]	145 minutes	37 minutes	Not mentioned
2008[28]	29.2 ± 10.8 hours	Not mentioned	2005[34]	Not mentioned	Not mentioned	96 minutes
2008[29]	360 minutes	50 (25–68) minutes				
2012[30]	300 minutes	Not mentioned	2010[33,34]	60-210 minutes	30-110 minutes	60-177 minutes; 57.3±17.6 minutes
2015[20]	not less than 360 minutes	Not mentioned	2011[34]	Not mentioned	Not mentioned	64 minutes

When a heart attack strikes, seconds count for everyone, regardless of age, gender or ethnicity. Any delay in treating a heart attack increases the chances of permanent, irreparable damage to the heart, and, it could cost a life. For the best odds of saving the heart muscle, a heart attack victim must get to the emergency room before the elapse of 'Golden Hour' (critical one hour from the onset of a heart attack)[35-44]. Risk of dying from heart attack reduces by 50% when treatment is initiated within 1 hour[45,46].

Progressive loss of survival benefit with increasing delay to treatment[47,48,36]
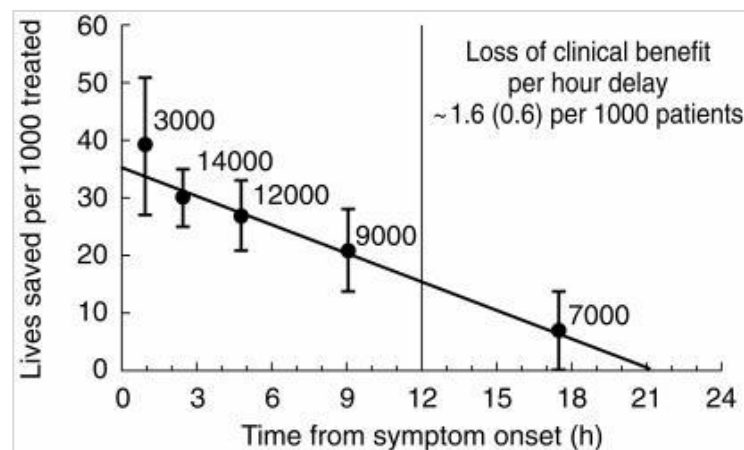
Considering the rising rates of cardiac events that are early-onset, sudden and fatal in our country, iMMi Life rightly focuses on timely diagnosis and appropriate management. Through remote cardiologist support it hastens the 'heart attack detection' phase, which in turn can economically impact the time to intervention and increase survival chances. By ensuring quick & reliable detection and enhanced pre-hospital care in the golden hour, iMMi Life is uniquely poised to save lives, and reduce medical costs.

iMMi Life aims to reduce the time lag between the onset of symptoms and treatment initialization
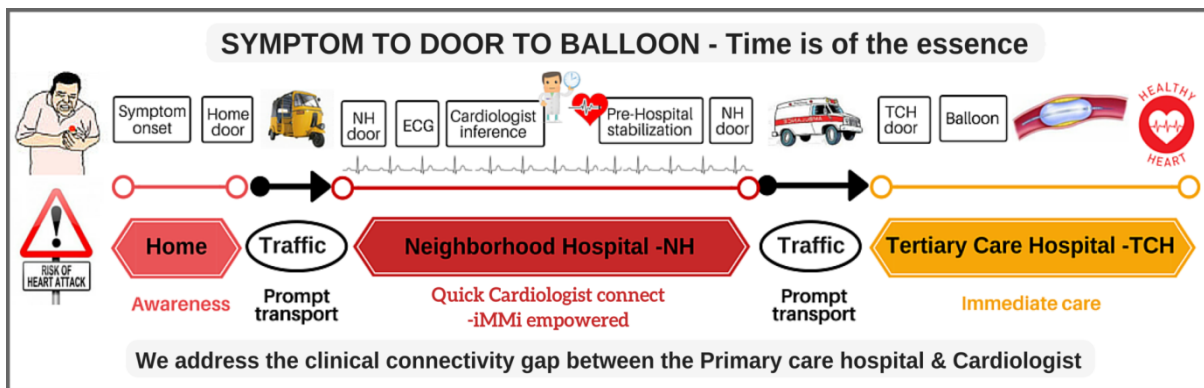
Hypothesis

To hasten the heart attack detection phase and bring down fatal heart attack numbers by addressing the clinical connectivity gap between the primary care hospital and cardiologist through a crowd-sourced, early detection system

Objectives

iMMi Life aims to reduce fatal heart attack numbers and improve clinical outcomes in cardiology by-
- encouraging a person to visit his/her neighbourhood hospital right at the onset of heart attack symptoms
- reducing the time lag between the onset of symptoms and hospitalization ('symptom to door' metric)
- empowering a local/attending physician with cardiologists' inference on ECG and patching them over phone (if opted), thereby paving way for initial line of treatment within Golden Hour.
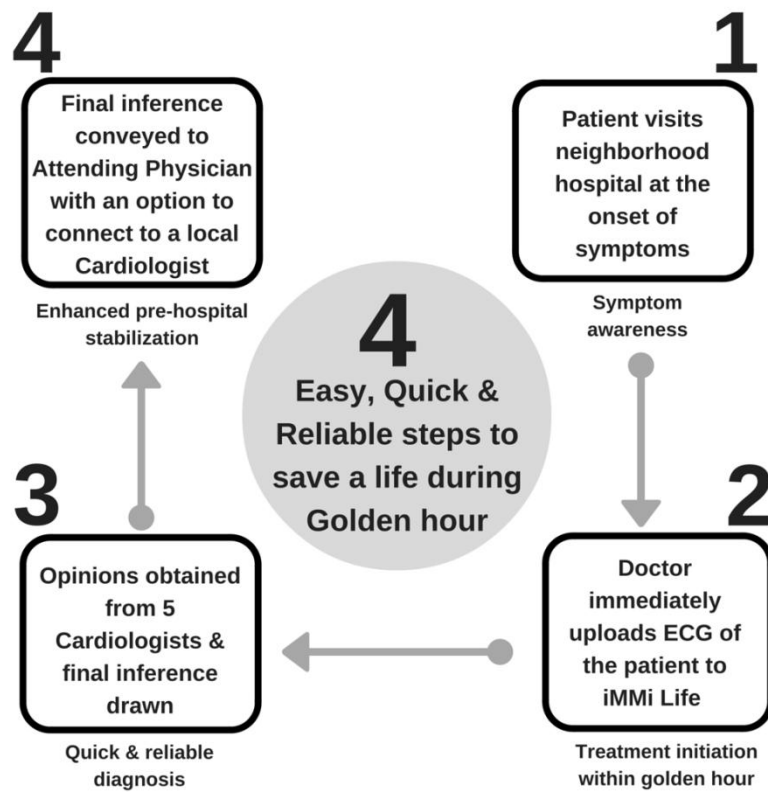
iMMi Life – Methodology

iMMi Life Healthcare empowers local neighbourhood hospitals with remote Cardiologists' cover
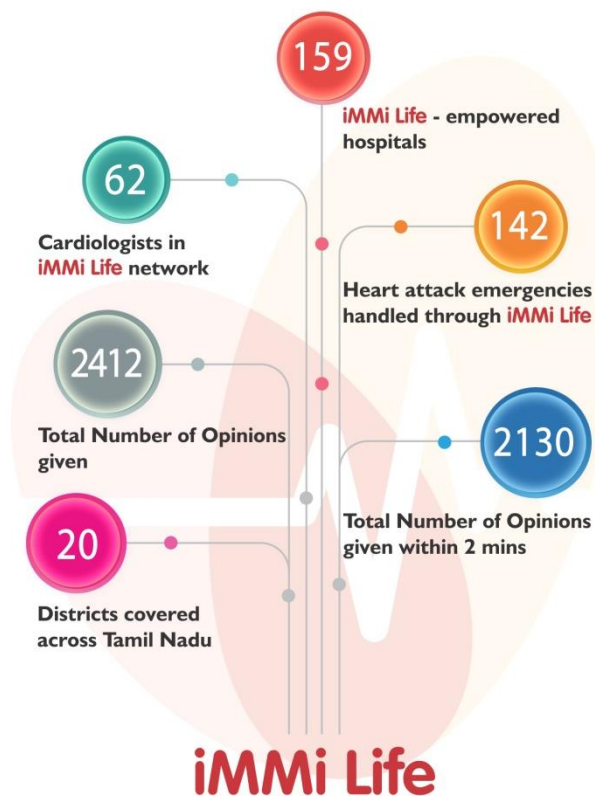
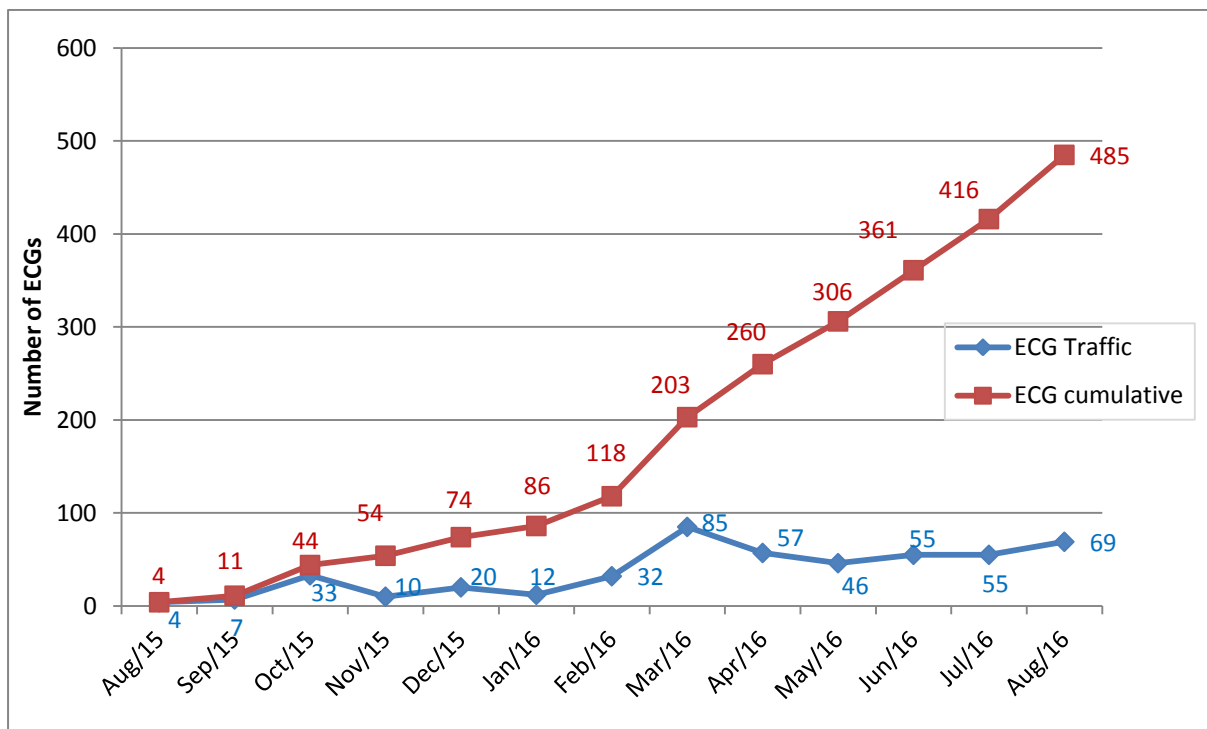## 4 Fast & Feasible steps to save a life during the Golden hour

4

Final inference conveyed to Attending Physician with an option to connect to a local Cardiologist

Enhanced pre-hospital stabilization

4
Easy, Quick & Reliable steps to save a life during Golden hour

1

Patient visits neighborhood hospital at the onset of symptoms

Symptom awareness

3

Opinions obtained from 5 Cardiologists & final inference drawn

Quick & reliable diagnosis

2

Doctor immediately uploads ECG of the patient to iMMi Life

Treatment initiation within golden hour

Interpretation of iMMi Life's data

The progress chart of iMMi Life system

159 — iMMi Life - empowered hospitals

62 — Cardiologists in iMMi Life network

142 — Heart attack emergencies handled through iMMi Life

2412 — Total Number of Opinions given

2130 — Total Number of Opinions given within 2 mins

20 — Districts covered across Tamil Nadu
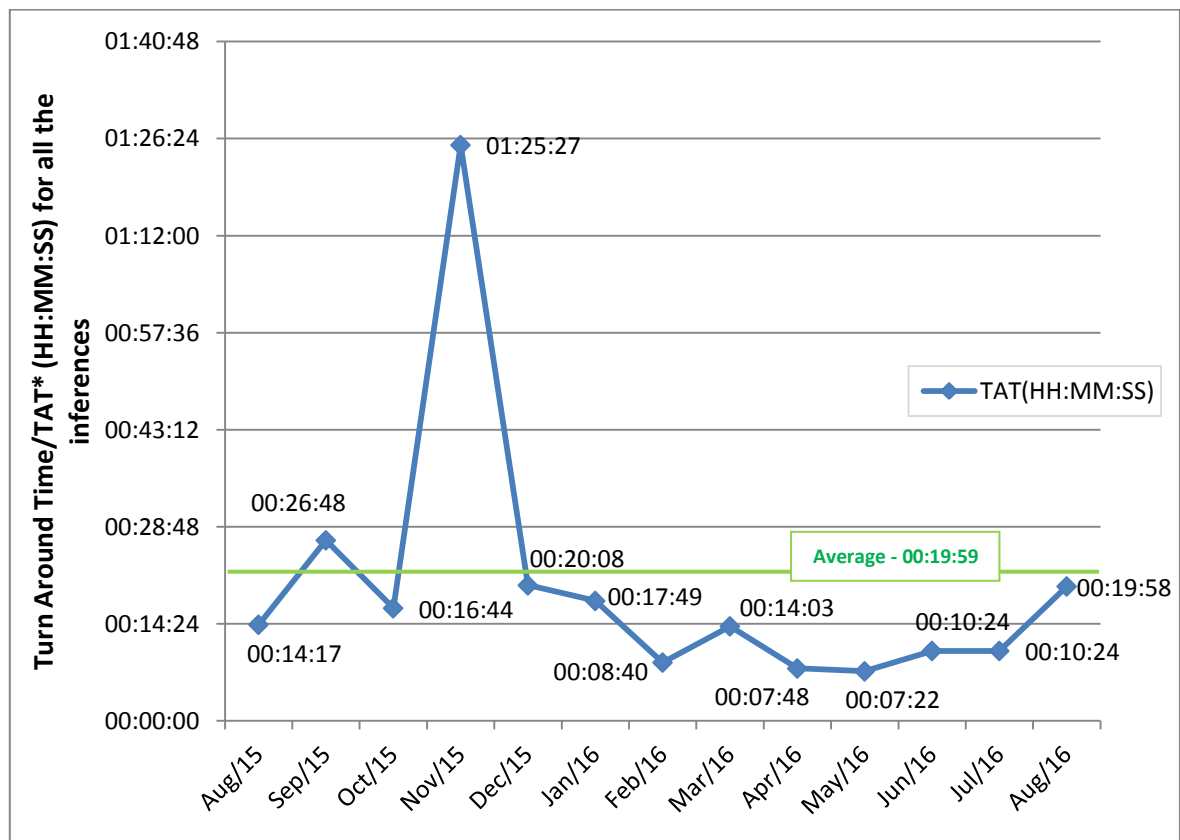
iMMi Life

iMMi Life's ECG traffic (from August 2015 till date)
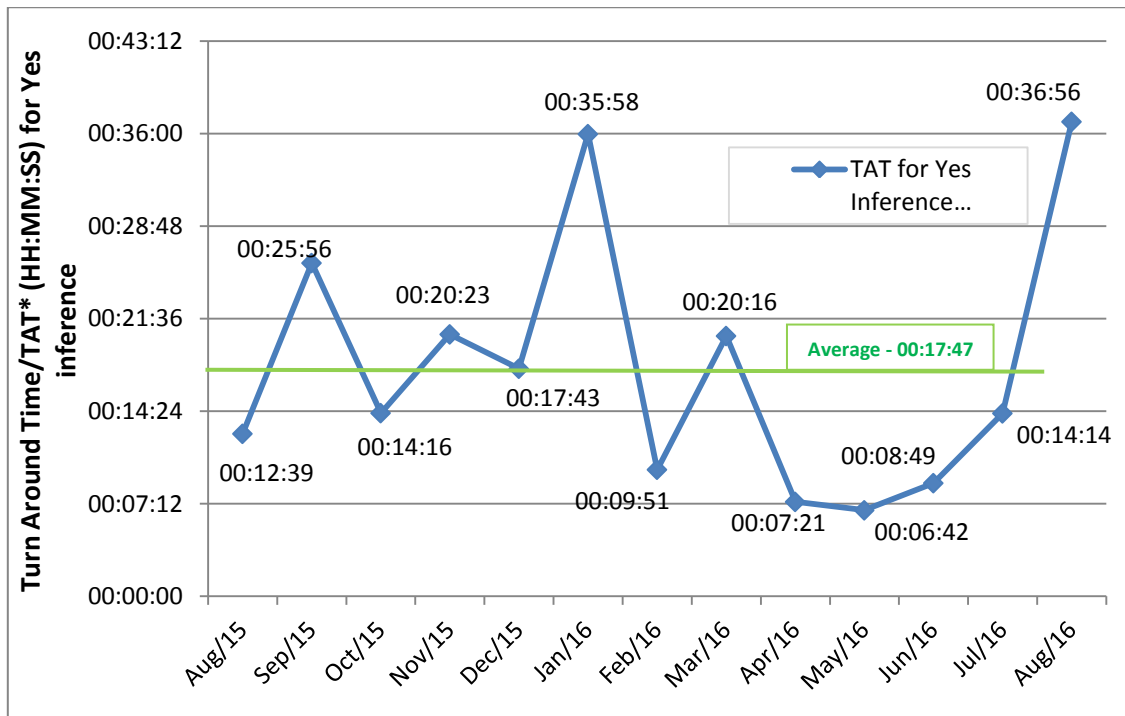

## Turn Around Time/TAT* (HH:MM:SS) for all the inferences

Turn Around Time/TAT* (HH:MM:SS) for Yes inference

(*Turn Around Time (TAT) for each case is the time from ECG upload in the iMMi Life system by the iMMi centre (iMMi-empowered neighbourhood hospital/nursing home) till the final inference (clinical majority from 5 cardiologists) is displayed to the iMMi centre. Acquisition of ECGs from iMMi centres through whatsApp & upload to our system might have taken some time. This fragment of time might not be included in TAT)
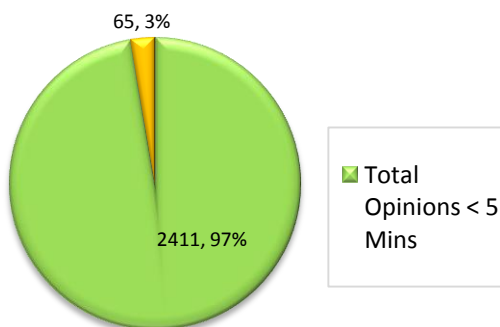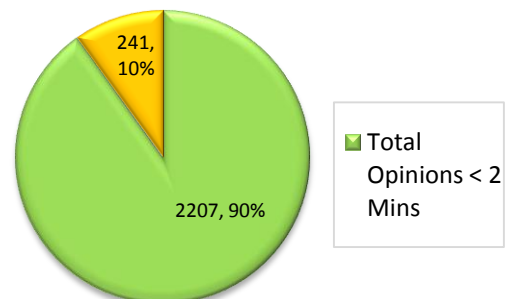
Time interval for opinions given

Time interval for opinions given

Legend:
- ■ < 10 Mins
- ■ < 20 Mins
- ■ <30 Mins
- ■ > 30 Mins

24, 5%
34, 7%
159, 33%
268, 55%
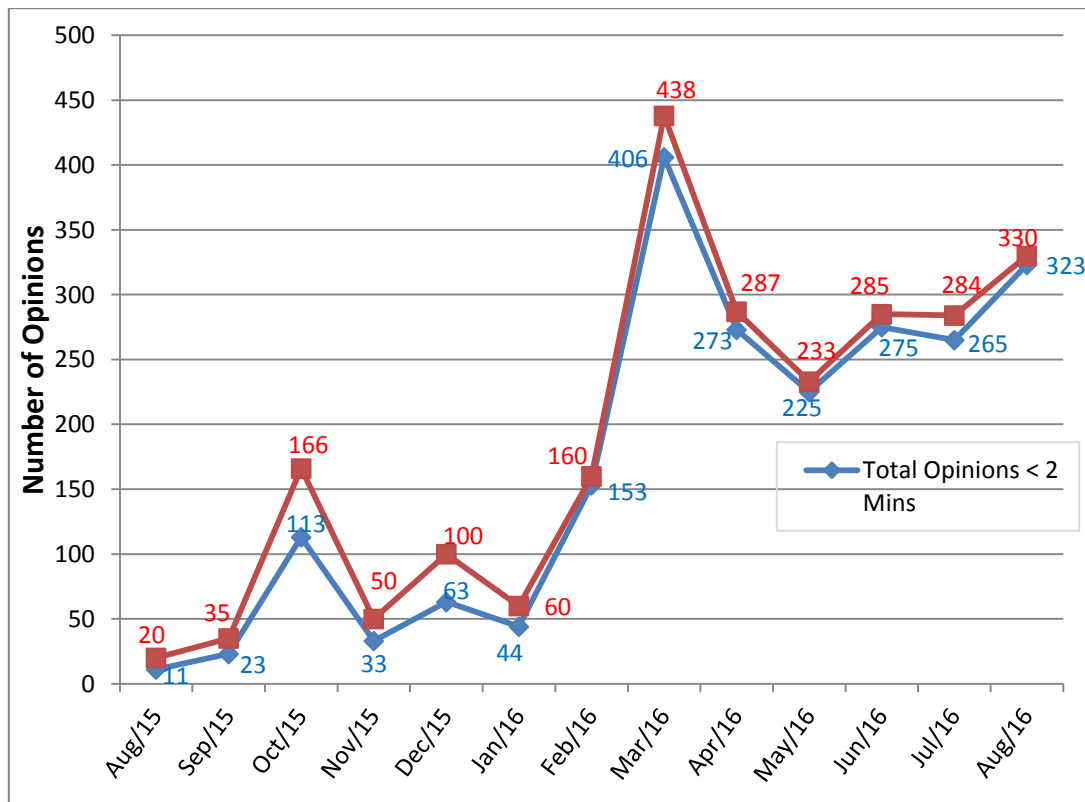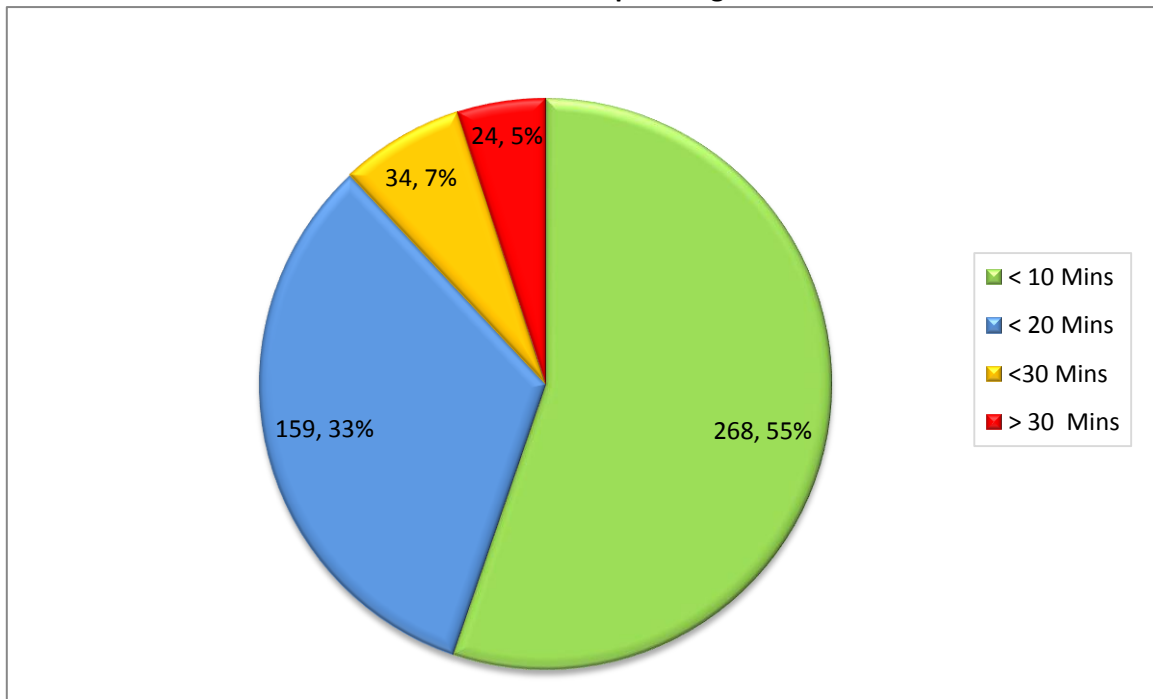
Opinions given within 5 minutes

65, 3%
2411, 97%

- ■ Total Opinions < 5 Mins

Opinions given within 2 minutes

241, 10%
2207, 90%

- ■ Total Opinions < 2 Mins

Routine ECG – a near future proposal of iMMi Life

An ECG taken to detect the heart rhythm or investigate the cause of chest discomfort (if any) will be opined by Cardiologists in iMMi Life's network for a normal or an otherwise (abnormal) outcome. Abnormal outcomes in atrial rhythms (sinus rhythm, sinus bradycardia, sinus tachycardia, atrial premature complexes), junctional rhythms (junctional bradycardia, junctional tachycardia), AV conduction (first degree AV block, second degree AV block, complete AV block) and ventricular rhythms (ventricular premature complexes or VPCs, couplet VPCs, ventricular tachycardia) will be highlighted in the Cardiologists' opinion.

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