



# SijariEMAS REFERRAL EXCHANGE SYSTEM

Improving the referral system for maternal and newborn emergencies in Indonesia

TECHNICAL REPORT  
JULY 2015



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## BACKGROUND

Although Indonesia has made widespread improvements in maternal and newborn survival over the last few decades, maternal and newborn mortality remain high [1,2]. Many of these deaths are preventable with timely access to quality care in a medical emergency [3]. Efficient and effective referrals to appropriate health facilities during emergencies—as well as improved quality of care during emergencies—are keys to reducing maternal and newborn mortality.

Across the geographically vast and populous country, Indonesia has a well-established, decentralized health system with a large network of community midwives, community health centers (puskesmas) and hospitals. In the 1990s, the Government of Indonesia worked with communities to address delays in recognizing obstetric emergencies and seeking care. These initiatives have been scaled up nationwide to increase awareness about birth preparedness and complication readiness (known as *Program Perencanaan Persalinandan Pencegahan Komplikasi*, or P4K) and to mobilize villages to respond quickly in case of an emergency, by notifying health providers and arranging transportation, blood donations, and medical funds (known as *desa siaga*, meaning “alert village”) [4].

However, referrals between midwifery clinics, puskesmas and hospitals are often poorly coordinated and communicated. As a result, critical delays occur during emergency referrals and in the acceptance and treatment of referred patients [5]. A number of issues have been found to limit the effectiveness of the referral system [5,6]:

- women are often referred to multiple health facilities before appropriate treatment is provided;
- referrals are made to health facilities that are not prepared, equipped or staffed to manage emergencies;
- midwives do not refer women in a timely manner, which may be associated with a lack of knowledge of when and where to make referrals;
- patients in puskesmas are not appropriately stabilized before they are referred;
- health facilities lack standardized protocols for managing emergencies and referrals; and
- hospitals and puskesmas lack effective coordination on allocating and mobilizing resources to handle maternal and newborn emergencies and referrals, as well as implementing policies and programs for emergencies.

In 2011, the USAID-funded Expanding Maternal and Neonatal Survival (EMAS) program [7] was launched in collaboration with the Government of Indonesia to contribute to reductions in maternal and newborn mortality. In addition to improving the quality of emergency obstetric and neonatal care services in hospitals and puskesmas, EMAS works to strengthen the referral system between health facilities. EMAS also aims to strengthen accountability for improved maternal and newborn survival through civic engagement.

The purpose of this document is to describe how EMAS has implemented SijariEMAS, progress made to date, and lessons learned regarding the use of SijariEMAS to improve referrals for maternal and neonatal emergencies.

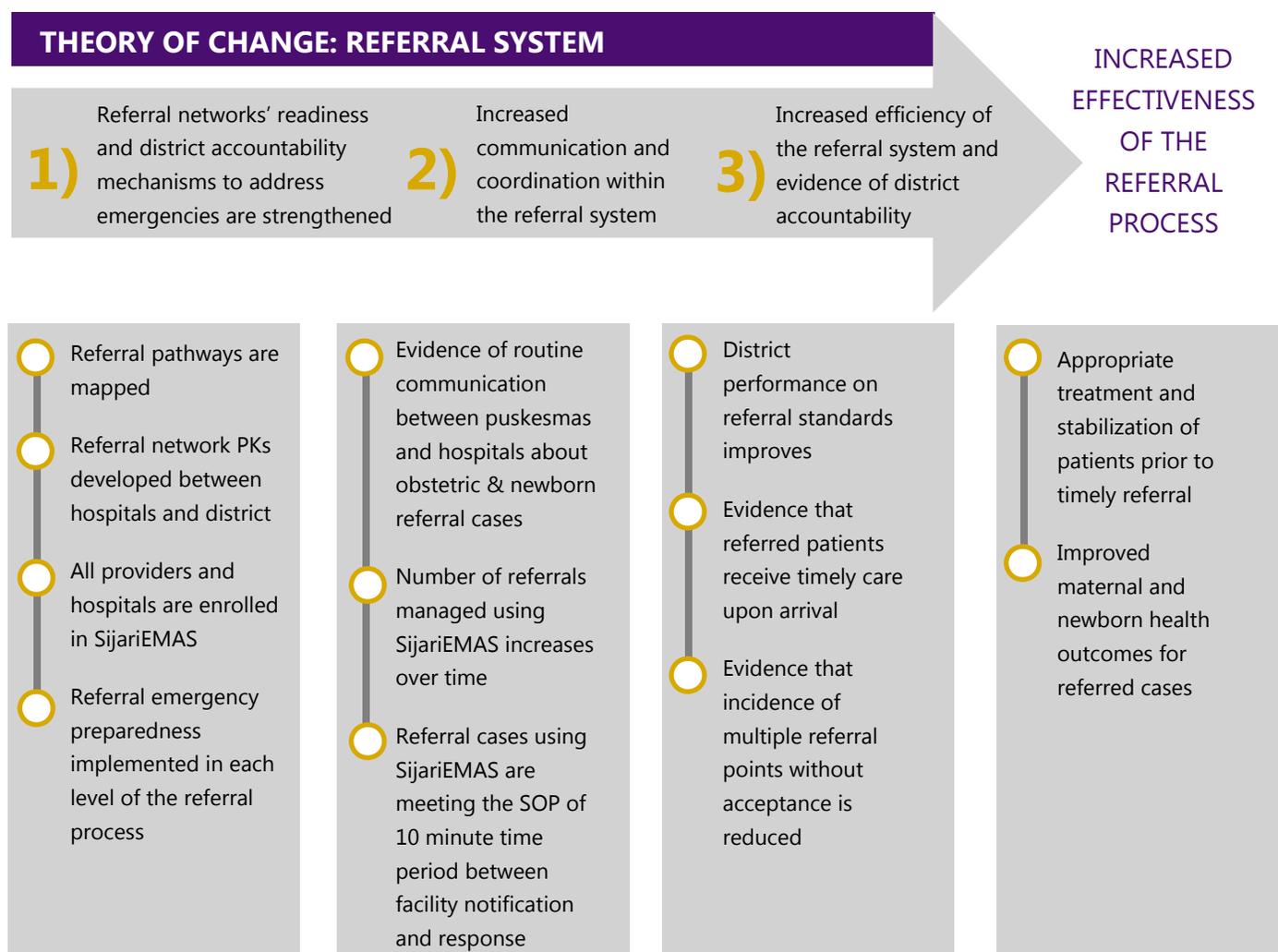
Prior to EMAS, village midwives reported they did not communicate with the hospital before making a referral, as they felt the hospital would say there was no room and reject the patient [6].

## REFERRAL STRATEGY

EMAS works to increase the efficiency and effectiveness of emergency referral systems through a number of interrelated interventions. These include:

- strengthening linkages and formalizing referral networks between puskesmas and hospitals through development of Perjanjian Kerjasama (PK, or network MOUs) [8];
- improving communication and coordination of referrals between providers and facilities through a referral exchange system;
- introducing Referral Performance Monitoring Tools in district health offices and health facilities to assess, monitor and improve referral processes [9]; and
- reducing financial barriers to emergency health care through promoting the uptake of social health insurance [10].

**Figure 1: EMAS causal pathway for referral system**

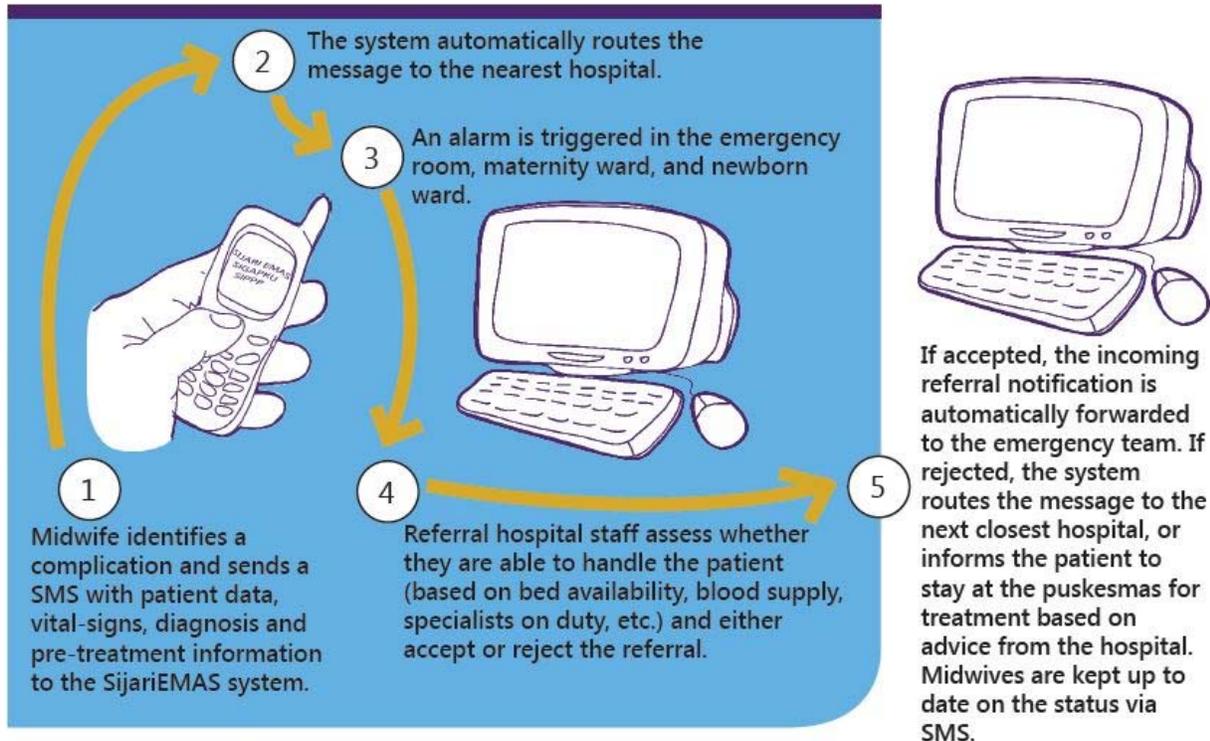


## REFERRAL EXCHANGE SYSTEM - SijariEMAS

EMAS developed an innovative, computerized referral exchange system, —*Sistem Informasi Jejaring Rujukan Maternal & Neonatal* (SijariEMAS), to improve communication between puskesmas and hospitals and thereby help to reduce delays in seeking care, referring patients and providing care. SijariEMAS automates the referral process; it provides linkages between health facilities in order to improve communication and responsiveness regarding referrals within a district.

SijariEMAS improves emergency referrals of mothers or newborns, most commonly from midwives in the community or at a puskesmas who recognize a complication that needs more specialized care (see Figure 2 for a simplified description of the process). SijariEMAS was initially SMS-based [11], given Indonesia’s almost universal use of mobile phones and text messaging, good network coverage, as well as relative ease of development. The referral exchange system is underpinned by a detailed mapping of all public and private health facilities [12] and development of agreed referral pathways for a district. These are formalized in a *Perjanjian Kerjasama* (a type of MOU), and programmed into SijariEMAS to automate the routing of referrals. The system enables hospitals to respond to referrals more efficiently (ideally within ten minutes), so that midwives can quickly inform families where to go.

**Figure 2: How SijariEMAS works**



The SijariEMAS system was created to:

- improve communication and coordination between health facilities during the referral process;
- improve the readiness of hospitals (within the referral network) to deal with incoming emergency maternal and newborn referrals;
- ensure that referrals are routed to a hospital in an efficient manner to prevent patients from being referred to multiple hospitals before treatment is received; and
- encourage the exchange of emergency referral case information between health providers.

In addition, SijariEMAS provides District Health Offices (DHOs) and hospitals with data to help them better understand the referral process and improve the quality of services provided. This information is presented and discussed at Pokja [13] meetings. Key data collected through the system include:

- referral case data, including the patient's vital signs, diagnosis, and insurance scheme;
- summary of treatment provided to patients pre and post-referral;
- communication between health facilities regarding the referral case, including treatment advice from the hospital to the puskesmas; and
- referral case response times.

"My hospital now is more ready to receive emergency maternal patients, since now we know the status and condition of patient beforehand. We could also provide advice to the midwives to give stabilization needed before transporting the patient. As result, the patient arrived at hospitals in better condition."

Head of SMF Obgyn, RSUD Karawang

## DEVELOPMENT OF SijariEMAS

In early 2012, EMAS conducted a referral system assessment in 10 districts (see Box 1) to inform the design and features of SijariEMAS [14]. EMAS worked closely with the MOH to ensure SijariEMAS aligned with relevant policies and existing health information systems. Using feedback from this assessment, SijariEMAS was designed to address the key gaps in existing referral systems, to be easy to use, and to be easily accessible to all health facilities and providers. The SijariEMAS software was developed to be 'agile' [15], i.e. the system can be continuously reviewed and approved based on user feedback.

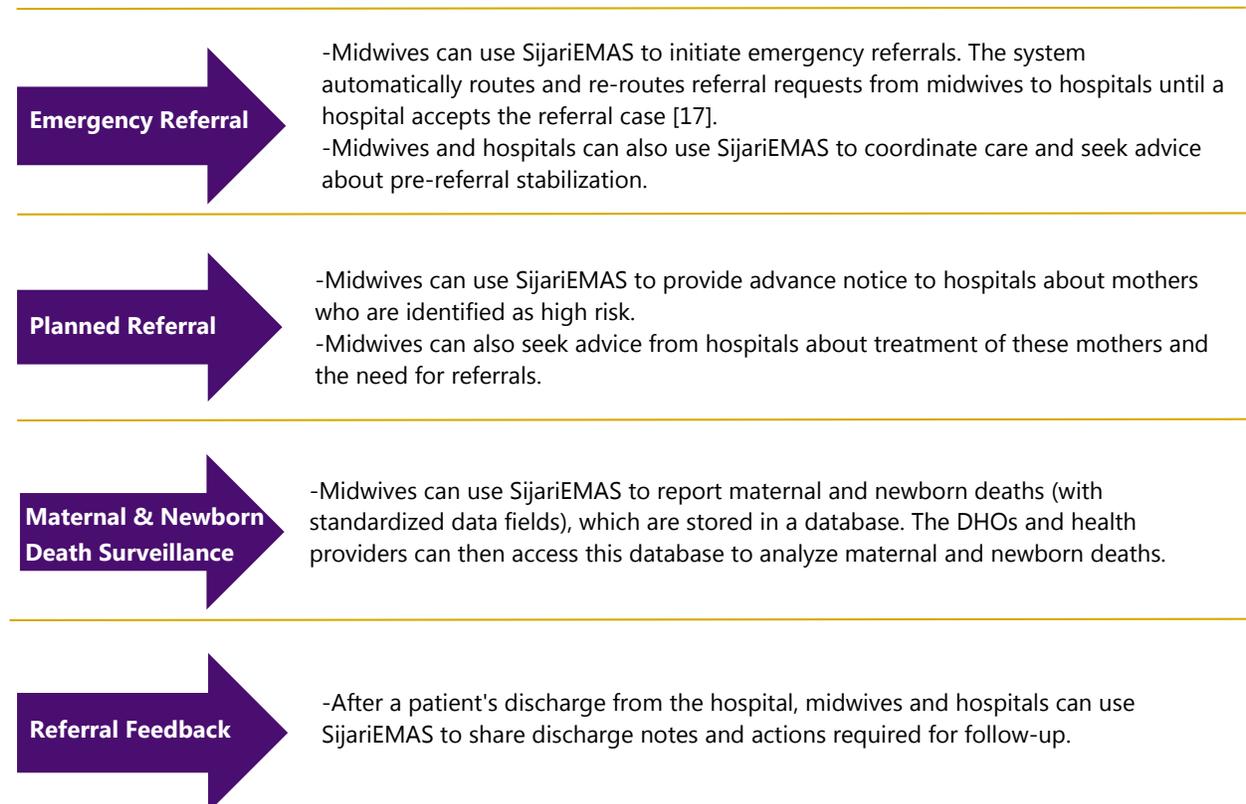
### Box 1: EMAS referral system assessment findings

- Lack of an official network between midwives at puskesmas and hospitals or specialists
- No agreed criteria for referrals, including when cases should be referred—leading to refusal of referral cases that hospital staff believe should be treated elsewhere
- Lack of hotline services at hospitals, or underused and mismanaged referral systems with limited communication and consultation between health providers
- Lack of sufficient district-level policies on recording and reporting referral cases for puskesmas and hospitals
- Most (90%) of midwives own mobile phones and are willing to use these to refer patients (by SMS)
- No systematic method of reporting/recording maternal and neonatal deaths

### SijariEMAS FEATURES

While its central and most utilized function is facilitation of emergency referrals, the SijariEMAS system was designed with a number of other features (see Figure 3), based on feedback from intended users during the design stage [16].

Figure 3: SijariEMAS features



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### Communication Tool

-Midwives, hospitals and DHO can use SijariEMAS as a communication tool to send messages or advertise upcoming events, or for customer relations

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### Hospital Readiness Information

-Hospitals can use SijariEMAS to relay information about their readiness to accept emergency referrals, including information on the availability of emergency room beds, specialists, equipment, and supplies.

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Overall, health providers and DHOs have provided positive feedback about the features of SijariEMAS. In particular, DHOs have noted that the communication tool has been useful for sharing health information. However, some features of SijariEMAS are not well-utilized, such as:

- Maternal and newborn death surveillance: Few midwives are reporting maternal and newborn deaths through the SijariEMAS system. If DHOs intend to use SijariEMAS to collect data on maternal and newborn deaths, more action may be needed to promote the use of this feature.
- Referral feedback: Few hospitals are providing referral feedback to midwives through SijariEMAS, which may be due to a lack of clarity as to who is responsible for providing this feedback. Health providers from the emergency room, maternity and newborn wards often need to coordinate discharge information and recommended follow-up. Roles and responsibilities for the provision of feedback to referring midwives may need to be clarified to increase the usage of this feature.
- Hospital readiness information: Few hospitals are providing information about the availability of emergency room beds through SijariEMAS. It is possible they prefer to keep emergency beds open for emergencies that have higher medical costs than maternal and newborn emergencies. To ensure that hospitals are transparent about their readiness to accept incoming referrals, DHOs may need to take action to promote the use of this feature.

## COMMUNICATION PLATFORMS

To ensure the SijariEMAS system is as accessible as possible to health providers, over time EMAS has developed four different communication platforms that can be used to exchange information: SMS, mobile application, web application and phone/voice communication. Box 2 describes each communication platform.

## Box 2: SijariEMAS Communications Platforms

SMS	Mobile Application	Web Application	Phone/Voice Communication
SMS was the first communication platform developed (2012) due to its widespread use and low cost (~Rp.150-250, or \$0.011-.017 per SMS)	Added in Year 2  The mobile application is a free, Android-based application designed as an alternative to SMS on mobile phones	Added in Year 3  The web application is a free application that can be accessed from any web browser	Added in Year 3  In some districts, DHOs or hospitals have a call center or dedicated phone line for emergency referrals
Midwives use pre-specified SMS codes to initiate referrals through SijariEMAS	To initiate referrals through SijariEMAS, midwives complete a simple form	To initiate referrals, midwives complete a simple online form	Midwives can contact call centers directly to initiate referrals over the phone or obtain treatment advice from hospitals
Also allowed phone calls from mobile phones	The application also features other tools, such as patient data management, national clinical standards, referral system information	The application also features other tools, such as patient data management, national clinical standards, referral system information  Skype facility to be added in Phase 3, to enable face-to-face communication during stabilization	Call center staff then manually enter the referral case information into the SijariEMAS system  EMAS is revitalizing and linking call centers to SijariEMAS

Overall, approximately 70–80 percent of referrals are made using SMS, followed by phone calls. Improvements to the system are described in the section, “SijariEMAS IMPLEMENTATION AND DEVELOPMENT BY PHASE”.

## SijariEMAS MODELS

SijariEMAS is used in a variety of contexts - large and small districts, rural and urban locations, and in areas with strong or weak connectivity. As such, EMAS developed three different models of SijariEMAS – Minimum, Standard, and Optimal Model – to allow for the varied needs and available resources of different districts. All models allow midwives to initiate referrals through SijariEMAS using all four communication platforms, however the ways in which the referrals are received and managed by each hospital differ. Table 1 summarizes the basic requirements and features of each model.

**Table 1: Comparison of SijariEMAS models**

	<b>Minimum Model</b>	<b>Standard Model</b>	<b>Optimal Model</b>
<b>Recommended district size</b>	Small districts	Medium districts	Large districts
<b>Typical number of facilities</b>	1 hospital, 10-15 puskesmas	5 hospitals	10 hospitals or more
<b>Features: Hotline Referral alarm</b>	Emergency room (ER) phone line (mobile or fixed, ideally dedicated) Referral alarm at one location in hospital (where emergency patients enter)	Dedicated hotline for emergency referrals at hospital (fixed or mobile – carried by head midwife) Referral alarms in three locations in hospital, referral alarm at DHO [18]	24-hour integrated call center at DHO or hospital Dedicated mobile phone hotline at hospital as backup Referral alarms in five locations in hospital [19] Referral alarm at DHO Referral alarm at puskesmas
<b>Resource requirements</b>	Minimal resources are required; system can be implemented using existing infrastructure	Dedicated computers are required at DHO for monitoring, with 3 monitors at hospital Dedicated mobile phones required at hospitals to answer incoming referrals	Significant resources required: staffing of call center; internet connection; and procurement of equipment for call center and DHO monitoring (see Annex A)
<b>Administrative requirements</b>	Low	Low	Medium
<b>System ownership</b>	Hospital	Hospital and DHO	Hospital and DHO
<b>DHO involvement</b>	Minimal	Medium	High
<b>Maintenance</b>	Low: ensure hardware is maintained and there is internet access are available	Low: ensure hardware is maintained and there is internet access are available at hospital and DHO	Low: ensure hardware is maintained and there is internet access are available at hospital, DHO, and call center

In all models, when the hospital receives a referral request an alarm is triggered, but the number and location of alarms differs. Hospital staff assess the referral case information provided (e.g. patient data, vital signs, diagnosis, and health insurance) through SijariEMAS and determine whether they can accept the referral. The hospital's response is sent to the referring midwife through SijariEMAS.

Each model has phone number/hotline at the hospital that midwives can call to initiate referral requests or obtain pre-referral stabilization advice. Whoever receives the call [20] asks the referring midwife a set of standardized questions (prompted by the SijariEMAS system) to facilitate the referral, and this information is entered into and routed through SijariEMAS. Facilities who are unable to set up a dedicated hotline for emergency referrals are encouraged to use dedicated mobile phones instead. Hospital staff can download the SijariEMAS mobile application, and review call data records on these phones. Mobile phones are typically less costly than a phone line, and can be used in the event of power outages. They can also be easily transferred among dedicated hospital staff and shifts.

## **ADVANTAGES AND DISADVANTAGES OF SijariEMAS MODELS**

The key factor in determining which model is most appropriate in a particular district is the number of hospitals in the district, however the decision is usually based on the commitment of the District/DHO (and determined during PK development). For example, the Optimal model is best for a district with over ten hospitals [21], as the other models will not provide sufficient coverage or coordination between health facilities. Whereas in districts with only one hospital (i.e. a single referral point) this level of coordination is not necessary and it is much easier for the DHO to oversee referrals within the district. Smaller districts have more flexibility to 'upgrade' to a more complex model if they have sufficient resources to support this. For example, EMAS-supported Pinrang district elected to use the Standard Model of SijariEMAS with a dedicated phone line, despite it being a relatively small district with smaller numbers of health facilities [22].

The benefit of the Minimum model is that it requires little-to-no additional resources or equipment to establish. This also means it is quicker to deploy. However, the Minimum model does not allow coordination between two or more hospitals, making it less suitable for districts with a large number of hospitals. It also has limited involvement from the DHO, as they cannot monitor referrals and responses in real time. The Minimum model also relies on one alarm and phone-line at the hospital which requires ER staff to initiate communication with the labor/delivery ward.

The benefits of the Standard and Optimal models over the Minimum model include:

- more areas of the hospital are alerted to emergency referral requests;
- the alarm in the DHO allows them to intervene if it appears that hospitals are turning away too many referral cases or not responding to referral cases in a timely manner. The DHO 'alarm' is a light which turns red if referral not accepted within 10 minutes. The DHO can intervene by calling the hospital to check what is happening; and
- the DHO has greater oversight and information on how well referrals are managed, to help identify and support improvements where necessary.

## IMPLEMENTATION

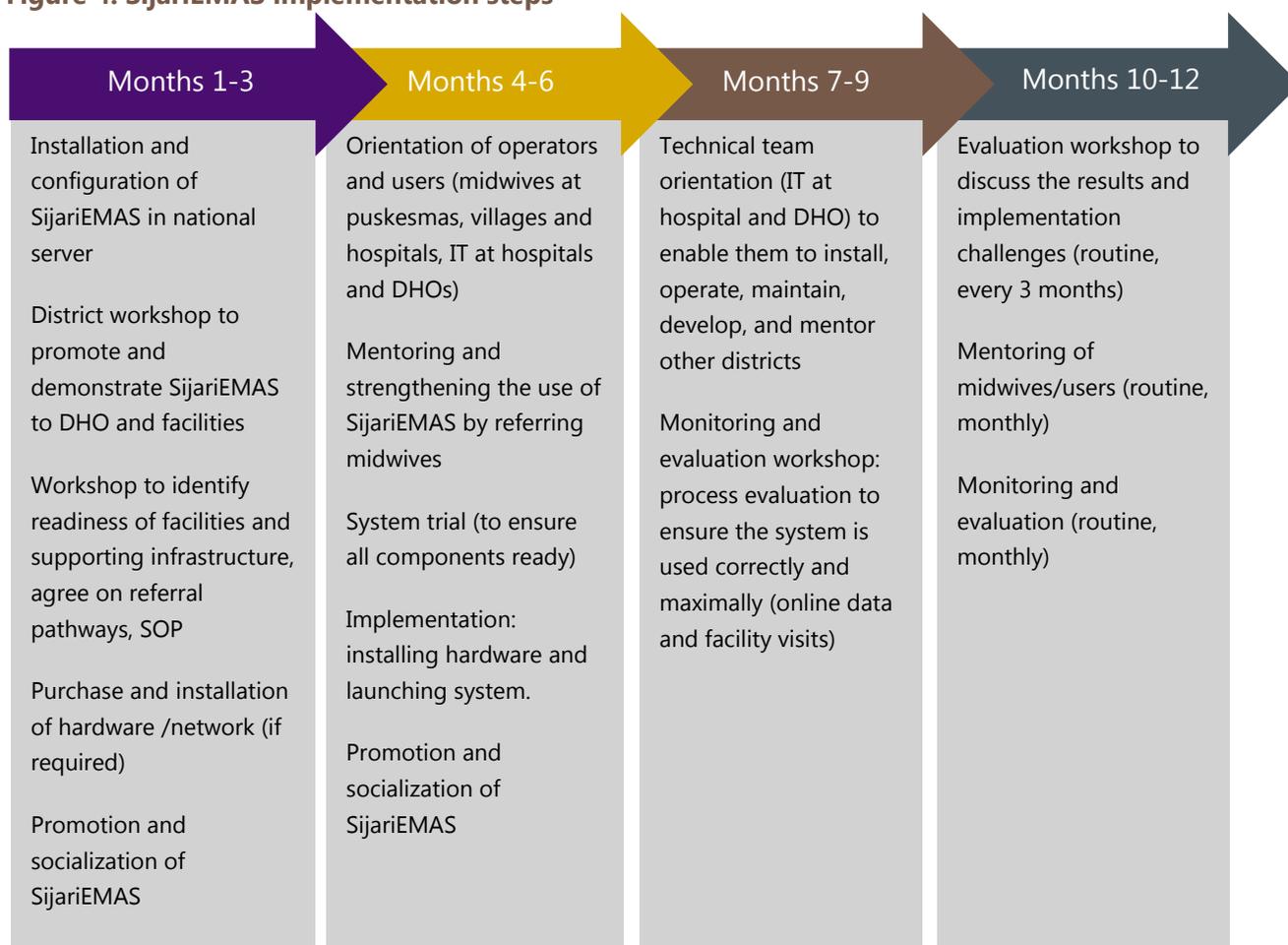
### IMPLEMENTATION OF SijariEMAS IN EMAS-SUPPORTED DISTRICTS

It is important to note that SijariEMAS can add the most benefit when it is coordinated with other initiatives to strengthen the referral system. For example, an agreed-upon *Perjanjian Kerjasama* (district MOU outlining referral pathways) should be in place before SijariEMAS can be implemented.

The implementation of SijariEMAS is similar for all three models and phases. The key implementation steps are summarized in Figure 5 below.

EMAS has promoted the use of SijariEMAS through its provincial teams. Workshops, seminars, exhibitions, and viral marketing have been held at the district level to promote and demonstrate SijariEMAS to relevant stakeholders [23]. SijariEMAS champions (see below), Pokjas, and Mother and Child Health Motivators (MKIA [24]) also promoted SijariEMAS.

**Figure 4: SijariEMAS implementation steps**



EMAS has taken a cascade approach to orienting stakeholders on how to use SijariEMAS. EMAS identified and oriented select stakeholders:

“SijariEMAS is very important and useful to be applied to all districts, not only to help the emergency maternal and newborn cases but also to assess and to improve the readiness of hospital in emergency preparedness”.

–Head of Maternal Ward, RSUD Karawang

midwives, nurses and doctors from DHOs, hospitals and puskesmas; SijariEMAS users at the hospitals [25] and puskesmas; plus information technology (IT) representatives from DHOs and hospitals. These ‘SijariEMAS champions’ were then tasked with orienting other health providers, such as village midwives and other hospital staff, on how to operate and manage SijariEMAS. Orientations for new districts are also conducted by champions/mentors.

Orientations provide a live demonstration of SijariEMAS, give the opportunity for participants to present their experiences and challenges in referring patients, and provide information on how SijariEMAS can be used to address these challenges. During orientations, hospital staff learn how to use the SijariEMAS web application, how to process SMS referrals, and how to use the call center. Midwives and puskesmas staff learn how to send referrals using SMS and how to use the call center for referrals.

At the writing of this brief, EMAS rolled out SijariEMAS in a total of 23 districts over two phases: ten districts in Phase 1 (May 2012 –September 2013) [26] and 13 districts in Phase 2 (October 2013–September 2014). The system is in the process of being expanded to 7 Phase 3 districts (January 2015–September 2016) [27]. The majority of districts are utilizing the Standard Model, as indicated by Table 2 below. EMAS has continued to support Phase 1 and 2 districts to improve and expand usage of SijariEMAS.

**Table 2: Phase 1 and 2 districts using SijariEMAS by type of model**

	Number of districts	Phase 1 districts	Phase 2 districts
<b>Minimum Model</b>	5	Malang; Sidoarjo (East Java)	Pasuruan; Jombang; Blitar (East Java)
<b>Standard Model</b>	14	Cirebon; Bandung (West Java) Banyumas; (Central Java) Serang (Banten) Pinrang (South Sulawesi) Asahan; Deli Serdang (North Sumatra)	Brebes; Cilacap; Kota Semarang (Central Java) Bulukumba; Gowa (South Sulawesi) Langkat; Labuhan Batu (North Sumatra)
<b>Optimal Model</b>	4	Tegal [28] (Central Java)	Karawang (West Java) Bogor (West Java) Tangerang (Banten)

## SijariEMAS IMPLEMENTATION AND DEVELOPMENT BY PHASE

### PHASE 1

Between September and December 2012, EMAS introduced and piloted SijariEMAS in some Phase 1 districts. In December 2012, SijariEMAS was launched nationally by the Ministry of Health's Head of Center for Data, with virtual participation from provincial and district officials. After the launch, EMAS introduced and modeled the system to district stakeholders in all of the Phase 1 districts.

In Phase 1, the Minimum Model was initially implemented in all ten districts (for speed of deployment), with the option of expanding to the Standard or Optimal Models as districts raised or allocated sufficient funds to implement a more advanced model. In fact, only two of the ten Phase 1 districts implemented the Minimum model, with the other eight mobilizing their own resources to implement the Standard Model (see Table 2 above).

EMAS Information and Communication Technology (ICT) specialists led the roll out of SijariEMAS in coordination with teams from each district. To promote more rapid deployment, in Phase 1 EMAS assisted districts with the installation of the system hardware and software components. Some districts already had the hardware components (e.g. servers and computers) required to operate the system; for districts with limited resources, EMAS provided the necessary hardware to the districts to enable the timely roll out of SijariEMAS.

Although all SijariEMAS features were tested, EMAS focused primarily on supporting health providers to effectively use the emergency referral feature. Improvements were made to SijariEMAS based on user feedback. In Phase 1, some districts did not yet have established referral pathways. While SijariEMAS was being developed in these districts, EMAS worked with them to develop referral pathways and establish MOUs (PKs) for referrals.

#### **Box 3: Lessons learned from SijariEMAS implementation in Phase 1 districts**

- SijariEMAS should not be deployed until the district referral PK has been developed.
- Most districts were able to mobilize resources to implement the Standard Model of SijariEMAS.
- User feedback was gathered and used to improve SijariEMAS.
- The approach of using SijariEMAS champions/mentors to orientate other staff worked well.

### PHASE 2

In Phase 2 SijariEMAS was rolled out to an additional 13 districts [29], using a similar process as Phase 1. Phase 2 districts were mentored by teams from successful Phase 1 districts. Criteria for SijariEMAS teams to begin mentoring is outlined in Figure 5. EMAS promoted the Standard and Optimal Models in Phase 2 districts with the resources to support these models. Only 3 Phase 2 districts implemented the Minimal model, with the majority (7) selecting the Standard and 3 selecting the Optimal model from the outset (see Figure 5). Districts were required to complete

clinical intervention preparedness assessments and have finalized MOUs that defined the referral pathways prior to the implementation of SijariEMAS.

#### **Box 4: SijariEMAS mentoring criteria**

SijariEMAS teams are able to begin mentoring and are Vanguards when:

- ✓ System is deployed and functioning
- ✓ Technical team (DHO IT, midwife, doctor in IGD hospital and hospital IT) is trained and able to operate and troubleshoot the systems
- ✓ Communication SOP for using SijariEMAS at the hospital is in place
- ✓ Systems are being used:
  - 90% of MCH providers in the district are registered and oriented
  - Job aids, routine seminars, etc.
- ✓ At least 1 hospital addresses 60% of emergency referral requests within the response time threshold directed in the SOP
- ✓ At least 25% of MNH referrals in the district are being facilitated through SijariEMAS

In January 2014, the Indonesian Government launched a new Universal Health Insurance (JKN) [30]. JKN mandates a pre-determined set of referral patterns. In some cases, these new referral patterns were not consistent with what was agreed upon with stakeholders as part of the PK and programmed into SijariEMAS prior to the rollout of the system. This affected the implementation and use of SijariEMAS and caused some confusion in the initial months of JKN roll-out. As a result, the new referral pathways for each district had to be re-mapped and re-programmed into SijariEMAS. However, the JKN referral pathways were not designed specifically for emergency situations, and were not always appropriate for maternal and newborn referrals. To address this, EMAS added a new feature to SijariEMAS that allows midwives to override the pre-programmed pathways and select a hospital of their choice directly. After the launch of JKN, the number of referrals using SijariEMAS decreased slightly because not all hospitals (such as private hospitals) accepted JKN. The re-mapping required significant work, and delayed the roll out of SijariEMAS in some Phase 2 districts.

In Phase 2, EMAS continued to focus on the emergency referral features of SijariEMAS, and added the planned referral feature. While SMS was the most utilized platform, feedback from midwives indicated that the required SMS code formats, which included hashtags, were too complicated to enter. This discouraged some midwives from initiating referrals through the SijariEMAS system. In response to this feedback, EMAS simplified the required SMS codes. EMAS also developed the mobile application to provide a simpler alternative to SMS on mobile phones, however, further promotion of the web application may be required to increase usage.

In some districts, unreliable internet connectivity made it difficult for some health facilities to access the SijariEMAS system using computers. To help address this, EMAS trialed mobile tablets in some facilities. These tablets can operate on mobile networks, allowing health providers to access SijariEMAS even in the absence of internet connections. However, this has not worked as well as expected, and the tablets are now being used more for monitoring. In Phase 2, EMAS also commenced work on revitalizing and linking emergency call centers to SijariEMAS, adding voice communication capacity to the platform.

In Phase 2, EMAS identified that SijariEMAS use was constrained by the fact that only EMAS-supported puskesmas in each district were linked into the system. As a result, EMAS has focused on expanding the use of SijariEMAS in Phase 1 and 2 districts through incorporating additional facilities (public and private) and providers into a more comprehensive district referral network PK as well as the SijariEMAS system.

In Phase 2, SijariEMAS champions were identified and spotlighted to promote SijariEMAS to other facilities within EMAS-supported districts, as well as provincial and national levels. Provincial EMAS ICT officers continued to support SijariEMAS Mentors in Phase 1 and 2 districts to improve their capacity to manage the system and troubleshoot as challenges arose.

#### **Box 5: Lessons learned from SijariEMAS implementation in Phase 2 districts**

-The introduction of JKN required reprogramming of referral pathways in SijariEMAS. During this time, referrals through SijariEMAS decreased slightly (but have since picked up again).

-SMS is the most popular communication platform.

-User feedback in Phase 2 helped improve SijariEMAS, such as simplifying SMS codes and creating the mobile application.

-To encourage more private hospitals to use SijariEMAS, more features may need to be developed to address their specific needs.

### **PHASE 3**

Another seven districts will implement SijariEMAS in Phase 3 of EMAS. As per Phase 2, SijariEMAS will be introduced after the development of referral network MOUs (PKs), and follow a similar process to previous phases. Phase 3 districts will be mentored by mentors from both Phase 1 and Phase 2 districts. The Standard and Optimal Models are being promoted to Phase 3 districts, and EMAS will continue to revitalize and link emergency call centers to SijariEMAS.

For Phase 3, smaller districts will include all puskesmas in the PK and SijariEMAS from the outset. In large districts, puskesmas and other health facilities will be progressively added, due to the time required to program the large number of referral pathways into SijariEMAS.

In addition, a SijariEMAS Monitoring and Control System will be established at the national level using a cloud-based system. This will continuously monitor the SijariEMAS network in real time, and detect any technical problems at the early stages so that technical support can be provided. It will also track all incoming referrals throughout the network and provide another level of monitoring to help ensure that all emergency referrals are responded to in a timely manner. The National Dashboard will also provide data that can be used to triangulate EMAS M&E data, and to analyze and feed this data into policy dialogue as appropriate. Lastly, EMAS will work with MOH to identify and plan for strategic integration and harmonization of SijariEMAS functions and data into existing or potential health information systems.

## RESULTS

As of March 2015, a total of 16,795 midwives and doctors have been registered in SijariEMAS, and the system installed in 152 EMAS-supported hospitals and 661 puskesmas. These providers have used SijariEMAS to facilitate a total of 39,937 emergency maternal and newborn referrals.

Table 3 summarizes results by EMAS program phase, as of March 2015 [31]. In Year Three, a total of 14,774 referral cases were facilitated through SijariEMAS. This represents roughly 30 percent of all referral cases across the 23 districts where the system was rolled out. The most recent data available (Jan-March 2015), shows an increase in the percentage of cases managed through SijariEMAS in Phase 1 and 2 hospitals, when compared to Year 3 data (see Figure 5). A review of district-by-district use shows variation in use, with overall trends showing increased proportions of cases referred through the system.

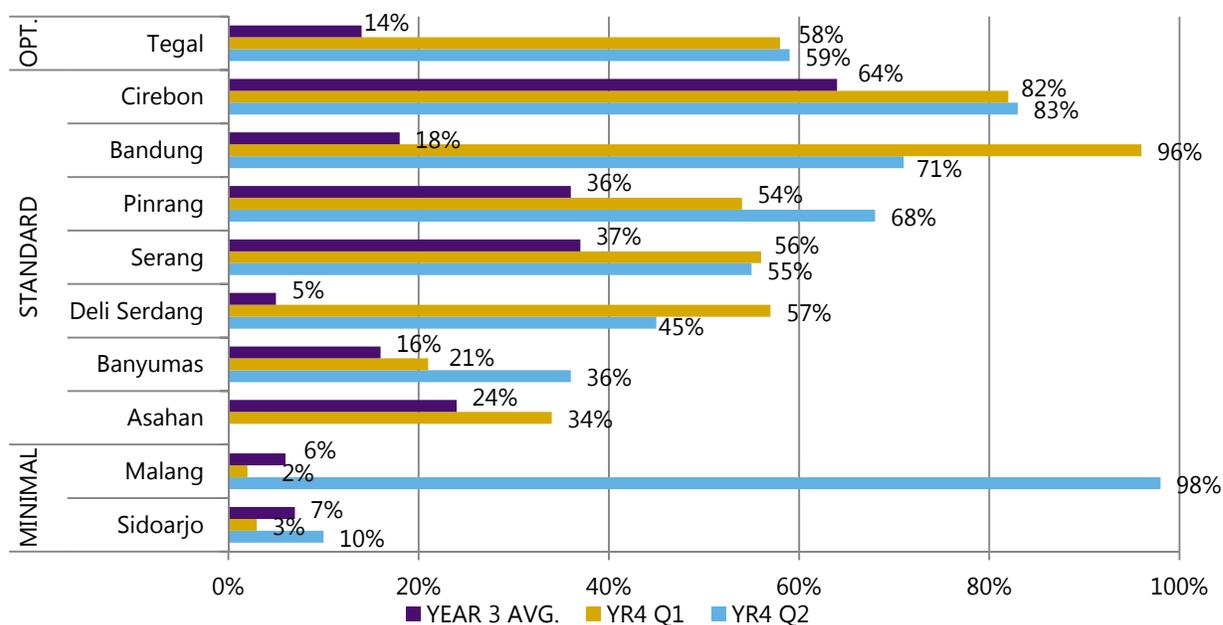
Three of these districts (Karawang, Cirebon, and Bogor) also managed the highest numbers of referrals using SijariEMAS, with totals ranging from 1277-1863 during Year 4, Quarter 2 - an average of 16 emergency referrals per day. However, data from other districts indicates lower and uneven usage between quarters.

**Table 3: SijariEMAS results, Year 4 Quarter 2 (Jan-March 2015)**

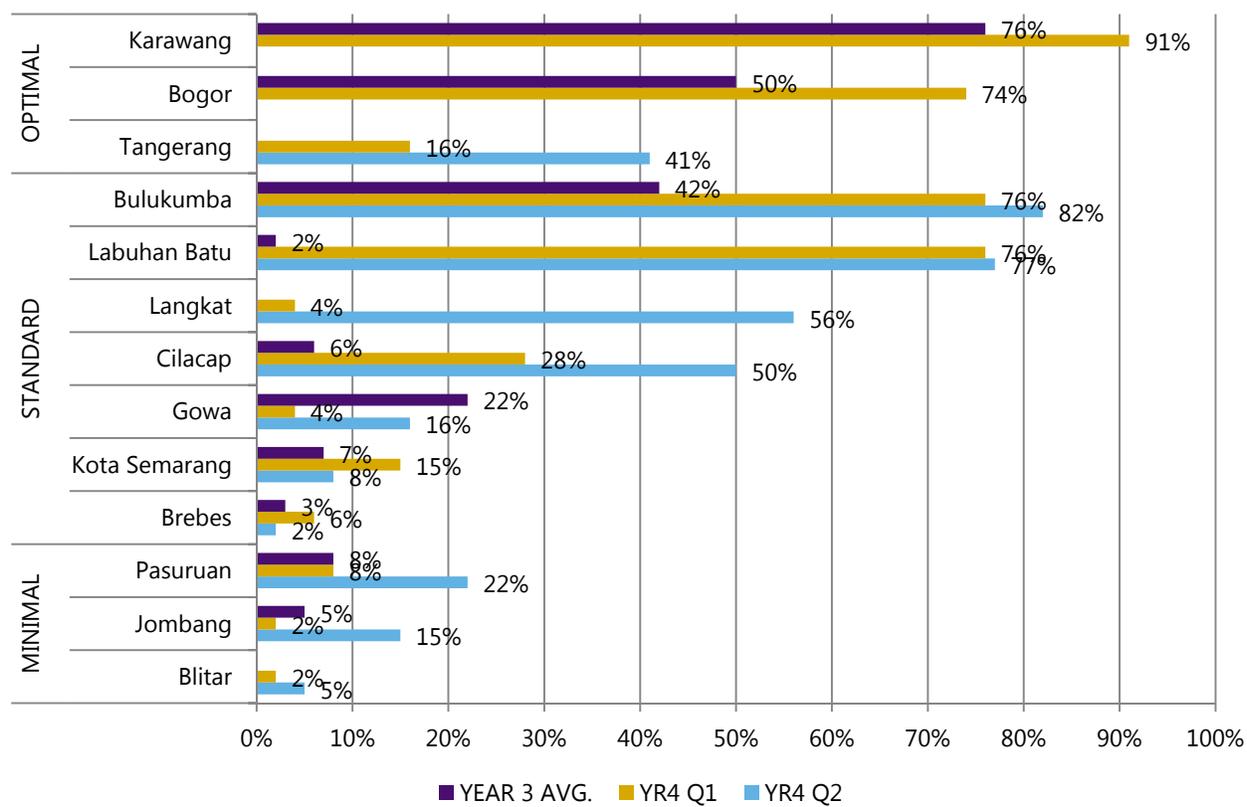
	Phase 1 districts	Phase 2 districts
Number of districts using SijariEMAS to facilitate referrals	10	13
% of EMAS-supported hospital referral cases managed using SijariEMAS	63%	56%
% of referral cases with hospital response occurring within 10 minutes upon receipt of SijariEMAS notifications	70%	69%

**Figure 5: Percentage of cases managed using SijariEMAS, Phase 1 & 2 hospitals, by model [32]**

### PHASE 1



## PHASE 2

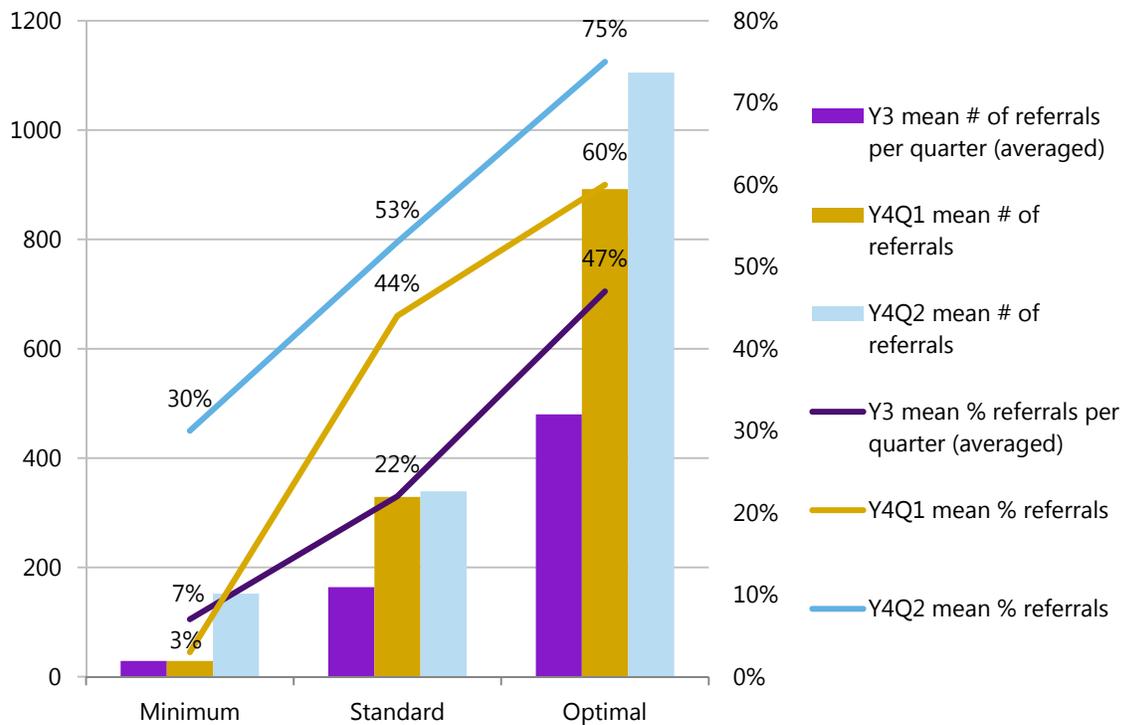


As seen in Figure 5, districts using the Optimal or Standard SijariEMAS models tend to have higher utilization of SijariEMAS to manage emergency referrals. However, Malang, a Phase 1 district, has seen significant uptake of SijariEMAS between Year 4 Quarter 1 and Year 4 Quarter 2 using only the Minimal model. Karawang and Bogor districts, which use the Optimal model, have shown tremendous SijariEMAS utilization rates. At the time of this report, Year 4 Quarter 2 data for Karawang and Bogor is still being verified, but it is anticipated that both of these districts will show close to 100% utilization rates for the quarter. EMAS will investigate the reasons why districts which use the Optimal or Standard models tend to have higher SijariEMAS utilization rates. EMAS will also use Malang district as a case study for how successful implementation of SijariEMAS can be done using the Minimal model, and present these lessons learned to other districts without the capacity to implement the Optimal or Standard models.

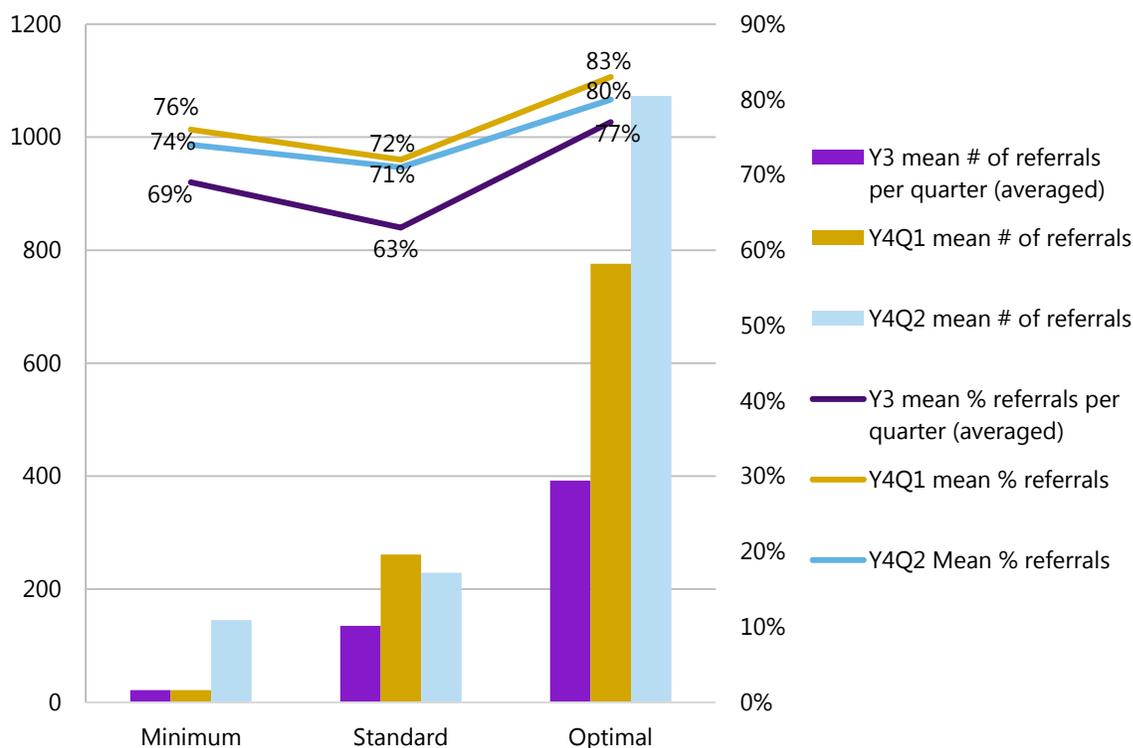
EMAS routinely collects data on how quickly hospitals respond to a new referral, in order to gauge overall functionality and hospital receptivity of the system. The data also indicates initial responsiveness. During Year 4 Quarter 2, Phase 1 hospitals responded to incoming notifications within 10 minutes of receipt for 70 percent of the cases. In Phase 2 hospitals, 69 percent of cases were responded to within this time threshold. While aggregate data show slight variation between quarters in terms of which hospitals take more than ten minutes to respond to new referrals, this indicator has generally remained relatively constant (around 20 percent) over time.

Figures 6 and 7 show the average numbers and percentages of emergency cases referred using SijariEMAS. These figures also show the proportion of hospital cases that are responded to within ten minutes, according to type of model. Overall, the five districts using the minimal model managed smaller numbers and percentages of cases using SijariEMAS. Midwives in these districts may have preference for communicating by telephone rather than by SMS. These districts also showed a smaller proportion of SijariEMAS cases that were responded to within ten minutes. For the majority of districts using the Standard Model the numbers and percentages of cases referred and responded to within ten minutes were greater, although there was wide variation between districts. The four districts using the Optimal Model are managing much higher numbers and percentages of cases using SijariEMAS. Furthermore, more of these referrals were responded to within ten minutes.

**Figure 6: Average total number and percentages of emergency cases referred using SijariEMAS, by model**



**Figure 7: Average total number and percentages of emergency cases responded to by hospital within 10 minutes, by SijariEMAS model**



### Box 5. Karawang district success story

Karawang District (West Java) has reported the highest percentage of referrals through SijariEMAS. Karawang launched SijariEMAS in September 2013, electing to implement the Optimal Model with a dedicated 24-hour emergency call center at the DHO. This was originally linked to three hospitals and 11 puskesmas. The call center has allowed the DHO to monitor hospital response time, coordinate with hospitals when delays occur, and re-write SMS formatting when needed to improve referral efficiency. SijariEMAS is now linked to 18 hospitals and 51 puskesmas in Karawang, with 1560 health staff registered in the system.

A key factor of the success of SijariEMAS in Karawang is the strong support from the DHO. In addition to establishing the Optimal model of SijariEMAS, all hospitals in the district now have an emergency number integrated with the DHO call center that can be contacted 24/7. Karawang's DHO has also expanded coverage of the call center to include general emergency cases as well as maternal and newborn emergencies. Karawang now serves as a model emergency call center. After visiting Karawang's call center, Tangerang has progressed with plans to purchase equipment and identify/recruit staff for a call center.

The Indonesian Ministry of Administrative and Bureaucratic Reform has selected Karawang for one of its Top 50 Innovation Awards for its use of SijariEMAS in helping to reduce maternal and newborn mortality.

## FACTORS RELATED TO SUCCESSFUL UTILIZATION OF SijariEMAS

**The use of SijariEMAS has been higher in districts where midwives can SMS or call a designated emergency number/hotline with a dedicated staff member available at all times to respond.** This can be either at the hospital or a call center, i.e. Standard or Optimal models. The best example of this is Karawang District (see Box 5).

**The combination of SMS and call-based options continues to be widely accepted and attractive for districts, with many noting that the combination is very useful in facilitating referrals.** Conversely, DHOs and facilities have provided feedback that without a dedicated hospital phone line for emergency referrals, it can be challenging for midwives to contact hospital emergency rooms. As a result, EMAS is now encouraging all districts to upgrade to the Standard or Optimal model (depending on their context). Upgraded call centers are designed to enhance SijariEMAS by enabling voice communication, enhancing tracking capabilities and improving monitoring. Districts that are transitioning to the Standard Model are in the process of setting up hotlines for hospitals or purchasing mobile phones that hospitals can dedicate to referral calls. These dedicated referral

“With SijariEMAS, midwives, health centers and hospitals have better coordination and communication during emergency maternal and newborn referrals. Now the DHO have timely data and information for each emergency referral.”

-DHO, Karawang

hotlines and mobile phones will further support the referral process by providing more options for communication between midwives and hospitals. If a midwife contacts the hospital by phone, the details are manually entered into SijariEMAS by the operator at the hospital.

**Commitment and ownership from DHO can lead to expansion of SijariEMAS.**

Bogor District (West Java) is a good example of the impact of strong DHO ownership. The Bogor DHO established a dedicated district-wide call center located at the DHO. Bogor began implementing the Optimal model in Phase 2, initially with 2 hospitals and 10 puskesmas. The system has since grown to cover an additional 91 puskesmas and 3 hospitals. This means that the majority of the district’s health facilities will be linked into the system.

**Strong champions and good network coverage across a district also affect the use of SijariEMAS.** For example, Cirebon District (West Java) consistently reports one of the highest total numbers of emergency cases referred using SijariEMAS. Cirebon’s success is attributed to strong support from participating hospitals: in particular, a champion in the ER who advises midwives to use SijariEMAS to refer emergency cases. The hospital has also invested in staff to help manage SijariEMAS (receive calls and enter information into the system). Once Phase 3 facilities are linked to SijariEMAS, the district will have achieved full coverage with the system. Additionally, the SijariEMAS network in Cirebon has expanded beyond EMAS facilities to include almost all facilities within the district. It also expands across provincial borders to include facilities from neighboring Central Java.

## LOOKING FORWARD: SUSTAINING AND EXPANDING SijariEMAS

Overall, activities to date have focused on laying the groundwork for sustained and expanded use of the SijariEMAS system. To promote the implementation and sustainability of SijariEMAS, EMAS has engaged local stakeholders in a variety of ways. PHOs, DHOs and the MOH were engaged in the design and development of the system to increase local ownership. EMAS has also collaborated with stakeholders, including the private sector, to leverage SijariEMAS infrastructure. Within districts, local technical teams and mentors have been developed to manage and maintain the system. DHOs have been encouraged and empowered to monitor referrals in real time, and district meetings (e.g. of midwives and DHO) have been used to discuss, evaluate and increase the use of SijariEMAS. Furthermore, SijariEMAS champions have promoted its use, both within and beyond their districts. There is a significant level of interest and enthusiasm about SijariEMAS both

“SijariEMAS has become part of the daily hospital information and communication system. Compared with before SijariEMAS implementation, now the communication during referral is more effective - for example patients with pre-eclampsia case are now managed with MgSO<sub>4</sub>. ”

– Head of SMF, Ob/Gyn, RSUD Serang

within and beyond EMAS-supported districts. Bupatis (or, heads of districts) have frequently been involved in the launch of the system within a district. While the use of SijariEMAS has varied across districts, DHOs are supportive and report that SijariEMAS has improved their referral processes.

Several districts have allocated funds to install SijariEMAS in additional (non-EMAS-supported) facilities in the coming years in order to provide full coverage across all facilities in their districts. Others are investing funds to purchase computers and hardware to support the SijariEMAS system. These additional funds help to expand SijariEMAS to include more hospitals, puskesmas, and midwives. For example:

- West Java has provided full budget support to implement the EMAS approach, including SijariEMAS, in five additional districts. The head of the province has stated he would like to expand SijariEMAS to other districts across the province.
- In Phase 2, Serang district (Banten) expanded SijariEMAS to all 32 puskesmas in the district using their own funds, and registered another 119 midwives in the system. In Phase 3, Kota Serang has moved to adopt SijariEMAS for their city (including private hospitals).
- Following a site visit to West Java to see SijariEMAS in action, West Sumatra’s PHO allocated funds to strengthen their referral system based on the EMAS approach, and has started to roll it out in some districts.
- Kota Makassar launched SijariEMAS in August 2014 using their own district funding (e.g. for orienting staff at main referral hospital and installing hardware). Kota Makassar plans to implement SijariEMAS in two additional hospitals and the Makassar DHO has already factored in SijariEMAS running costs into their five-year planning cycle to sustain the

program. This expansion of SijariEMAS directly links with EMAS-supported districts in surrounding parts of South Sulawesi, with cross-regional agreements established for referrals. Jakarta PHO has also expressed interest in SijariEMAS.

## CHALLENGES REGARDING SijariEMAS USE

The use of SijariEMAS has varied between quarters and continues to be low in several districts. A number of changes have been made to the system to address user feedback, as outlined above. While challenges and constraints differ among districts, there are a number of common themes, including:

- Behavior change challenges: Some facilities report they are reluctant to use SijariEMAS due to established referral preference (to hospitals outside the SijariEMAS coverage area), or slow/poor response times to SMS messages from receiving facilities (caused by telecom delays in delivering messages).
- Technological challenges: Barriers such as poor internet connectivity, issues with system stability, and problems with hardware have resulted in limited or uneven use of the system in some areas. In some cases these issues have been resolved by districts through the purchase and installation of improved internet systems.
- Insufficient commitment from some hospitals to use the system.
- Human resources constraints: some DHOs and/or hospitals feel they are unable to provide dedicated staff to support SijariEMAS call centers.

## LESSONS LEARNED

- Engaging end-users in the design and systematically using their feedback to revise the system and improve the user experience has been valuable in ensuring that the features of the system address their needs. Using an agile system development approach worked well, as it allowed continual focus on improving the functionality and stability of the system. As SijariEMAS was implemented in Phase 1 and 2 districts, areas where the system could be strengthened were identified and acted upon. For example, some midwives found the required SMS code formats complicated to enter, so EMAS simplified the codes. EMAS also developed the mobile application to provide a simpler alternative to SMS on mobile phones.
- Designing the system so it can be accessed through multiple communication platforms and using multiple devices has helped overcome some of the technical challenges. Since SijariEMAS is a computer-based system, technical constraints and challenges have a significant impact on the successful use of the system. A number of districts face issues with internet connectivity and electricity, with some districts experiencing electricity cut-offs for hours at a time. EMAS encouraged districts to develop Standard Operating Procedures so users know what to do in the event of technical issues.

- SijariEMAS requires an agreed and current referral network to work effectively. The stronger and more comprehensive the referral network (i.e. more hospitals and puskesmas included), the more effective it will be. SijariEMAS is often considered the most visible aspect of EMAS and has gained considerable attention within districts, provinces and national level. However, SijariEMAS is unlikely to improve referrals without a strong referral network underpinning it.
- SijariEMAS is used the most where there is a combination of SMS and a call center. For this reason, the Standard or Optimal Model are recommended. In developing the system, EMAS also considered the communication platforms that were widely used by midwives (e.g. SMS) to ensure that the system would be easier to adopt.
- Each model has pros and cons, but the decision regarding which SijariEMAS model to use is determined by each district through the PK process. Although at the start of EMAS the Minimum model was initially promoted, experience demonstrated that a combination of SMS and phone calls leads to higher utilization. Hospital response times are shortest in districts using the Optimal model. Drawing upon the success of integrating SijariEMAS and district call centers in West Java, EMAS will continue to support hospitals or DHO seeking to develop or expand their call centers.
- Commitment from the DHO and district health facility leadership is crucial to the implementation and adoption of the SijariEMAS system. This commitment can help ensure that districts allocate the necessary resources to implement a suitable model of SijariEMAS, (e.g. allocate funding, purchase additional ITC, allocate dedicated personnel for call center operation, etc.) and continue its use and expansion. Commitment from district leadership also helps health facilities to feel supported in the use of SijariEMAS.
- Promoting behavior change among health providers is critical to the success of SijariEMAS. Health providers must change the way they handle the referral process and adopt a new referral system. Orientations to build self-efficacy and demonstrate the benefits of the SijariEMAS system are key to encouraging its use. The use of champions to promote SijariEMAS has been successful (e.g. Cirebon).
- Roles and responsibilities can be clarified to better utilize all SijariEMAS features and ensure the system is managed properly. Staff at the DHOs and hospitals also rotate frequently; to ensure the system is properly managed, clearer delegation of authority for SijariEMAS teams may be required.
- Aligning and linking with relevant MOH systems should enhance scalability and sustainability. Sustainability is also increased when districts fund/purchase the required equipment themselves, rather than relying on EMAS to provide equipment.

## SijariEMAS Equipment Requirements by Model

MODEL	EQUIPMENT REQUIRED	MINIMUM MODEL	STANDARD MODEL			OPTIMAL MODEL
Location of server		National (cloud-based)	District	Hospital	National (cloud-based)	DHO/hospital
<b>District Health Office (DHO)</b>						
Monitoring	PC Client	1 unit	1 unit	1 unit	1 unit	1 unit
	LED Monitor 40"	1 unit	1 unit	1 unit	1 unit	1 unit
	Internet connection	1 package	1 package	1 package	1 package	1 package
SijariEMAS	Server	1 user account	1 unit			1 unit
	Public internet IP		1 package			1 package
	Modem		1 unit			1 unit
	SIM card		1 unit			1 unit
	Pulse SMS		1 package			1 package
Room	Rack server		1 unit			1 unit
	Air conditioner		1 unit			1 unit
	Electricity		1 package			1 package
Call center	Server call center					1 unit
	Telephone card					1 unit
	Phone lines					4 lines
	Pulse and telephone subscription					1 package
	PC/tablet agent					4 units
	Headset agent					4 units

<b>Hospital</b>						
Monitoring	PC client / tablet	1 unit	1 unit	1 unit	1 unit	1 unit
	Internet connection	1 point	1 point	1 point	1 point	1 point
SijariEMAS	PC client / tablet	1 unit	5 units	1 point	4 units	5 units
	Internet connection	1 point	5 points		4 points	5 points
	Speaker	1 unit	5 units		4 units	5 units
	LED monitor 40"		1 unit	1 unit	1 unit	1 unit
	Server			1 unit		
	Modem			1 unit		
	SIM card			1 package		
	Pulse SMS			4 units		
	Internet connection			4 points		
	Speaker			1 unit		
Room	Rack server		1 unit			
	Air conditioner		1 unit			
	Electricity		1 package			
Call center	Phone lines	1 unit	1 unit	1 unit	1 unit	1 unit
	Telephone	1 unit	1 unit	1 unit	1 unit	1 unit
	Call center		1 unit		1 unit	
<b>BEmONC/Puskesmas</b>						
SijariEMAS	PC client / tablet		1 unit			1 unit
	Internet connection		1 point			1 point
	Speaker		1 unit			1 unit
	Telephone					

## Sample Facility Equipment and Infrastructure Implementation Costs

DHO				
Cost	Server Spect Medium IBM/HP	1 unit	N/A	Hosted in EMAS Jakarta until the district is ready
	Computer monitor in the DHO	1 unit	Rp. 6,000,000 (\$429)	
	LED monitor for monitoring in the DHO	1 unit	Rp. 7,000,000 (\$500)	
	Internet network with public IP (1 year)	1 package	Rp. 6,000,000 (\$429)	If there is no existing connection
	Cost of SMS for emergencies (1 year)	1 package	Rp. 6,000,000 (\$429)	
	Cost of SMS for information for high-risk pregnant women (1 year)	1 package	Rp. 15,000,000 (\$1,073)	
	Modem for sending SMS and access number	2 units	Rp. 6,000,000 (\$429)	
	Air conditioner	1 unit	N/A	Hosted in EMAS Jakarta until the district is ready
	Shelf for server	1 unit	N/A	Hosted in EMAS Jakarta until the district is ready
	Publication materials (posters, leaflets, name cards)	Package	TBD	
	Socialization		TBD	
	Monthly routine monitoring – data evaluation should be discussed with the working groups (Pokja), DHO, and hospital		TBD	
Call center / DHO feedback mechanism	PC computer	1 unit	Rp. 10,000,000 (\$715)	
	LED monitor	1 unit	Rp. 7,000,000 (\$500)	
	Hand phone for emergencies (Android) and number	2 units	Rp. 2,000,000 (\$143)	
	Pulse call center	1 package	Rp. 2,400,000 (\$172)	
	Officer call center	6 people	TBD	
HOSPITAL				
SijariEMAS unit access	PC	4 units	Rp. 24,000,000 (\$1,716)	IGD, maternal, neonatal, treatment

	LED monitor	1 unit	Rp. 7,000,000 (\$500)	IGD, maternal
	Internet connection	4 points	Rp. 6,000,000 (\$429)	Can use existing internet connections: IGD, maternal, treatment
	Emergency hand phone (1 year)	1 unit	Rp. 1,000,000 (\$72)	
	Pulse call center (1 year)	1 package		
<b>BEmONC/Puskesmas</b>				
SijariEMAS	PC computer (optional)	1 unit	Rp. 6,000,000 (\$429)	IGD
	Internet connection (optional)	1 point	Rp. 3,600,000 (\$257)	IGD
	Emergency hand phone (Android) (1 year)	1 unit	Rp. 1,000,000 (\$72)	IGD
	Pulse call center (1 year)	1 package	Rp. 1,200,000 (\$86)	IGD
<b>TOTAL</b>	<b>Rp. 117,200,000 (8,380)</b>			

- [1] World Health Organization, UNICEF, UNFPA, and the World Bank. Trends in Maternal Mortality: 1990 to 2013.
- [2] United Nations Children's Fund. Levels and Trends in Child Mortality: Report 2014. New York: UNICEF; 2014
- [3] US Global Health Initiative. Indonesia Global Health Initiative Country Strategy 2011: Improved Health Impact Through Collaboration. Retrieved December 8, 2014, from <http://www.ghi.gov/whereWeWork/docs/IndonesiaStrategy.pdf>
- [4] Desa Siaga concept was introduced in the mid-1990s under the USAID-funded Maternal and Newborn Health (MNH) program to help communities prepare in advance for emergencies at the village level.
- [5] Mize, L., Pambudi, E., Koblinsky, M, et al.....And then she died: Indonesia Maternal Health Assessment. World Bank, 2010
- [6] Baseline Assessment of Referral Systems in EMAS Program Districts Report, EMAS 2012
- [7] EMAS is a five-year (2011-2016) program to support the Government of Indonesia to reduce maternal and newborn mortality. EMAS works with government (national, provincial and district), civil society organizations, health facilities, (public and private), hospital associations, professional organizations, and the private sector, across 30 districts of Indonesia. EMAS is a partnership of five organizations including Jhpiego (lead partner), Lembaga Kesehatan Budi Kemuliaan (LKBK), Muhammadiyah, Save the Children, and RTI International.
- [8] PKs formally define the roles, responsibilities and expectations of health facilities. They govern referral networks, and improve collaboration and coordination among facilities, and formally integrate private facilities into a district's referral network.
- [9] Referral Performance Standard Tools assess aspects such as: the steps taken during a referral (e.g, whether the patient was stabilized), factors such as ambulance availability and communication channels between health facilities, and preparedness of emergency teams. Developed in conjunction with the MOH, the agreed performance indicators enable health facilities and DHOs to monitor the referral system and identify gaps in referral performance.
- [10] Patients using national health insurance schemes are not always accepted by health facilities or receive the same standard of care as private patients/those paying user fees. EMAS works with facilities to address the challenges around accepting social health insurance, such as clarifying roles, responsibilities and the reimbursement process.
- [11] With other platforms added later – see Box 2.
- [12] Mapping determines proximity from a puskesmas to a series of referral hospitals, beginning with the ones that are closest and most accessible.
- [13] Pokjas are working groups formed at the district level comprised of influential individuals who are capable of resolving issues from communities and finding solutions for supply-side barriers to service provision (policies, budgets, etc.). Pokjas work in conjunction with the civic forum.
- [14] Baseline Assessment of Referral Systems in EMAS Program Districts Report, EMAS 2012
- [15] Agile system development is iterative and has the flexibility to change as required. The system is based on active user involvement throughout its development and continues to evolve/develop based on feedback and frequent testing help to identify any issues. Features can be added and the system can respond to change as requirements emerge, through incremental releases.
- [16] The system was designed to be able to accommodate all listed functionality. The function related to emergency referrals has been prioritized under EMAS. The actual use of other functions the system is capable of varies.
- [17] Codes automatically route to most relevant area/s of hospital i.e. ER/IGD maternity, or perinatal ward
- [18] ER/IGD, maternity, and perinatal wards

- [19] ER/IGD, maternity, perinatal, polyclinics and administrative
- [20] E.g. Midwife or call center staff
- [21] E.g. Bogor started with Optimal model due to its size. Bogor has a population of 5 million, 40 hospitals, and 101 puskesmas.
- [22] While Pinrang's two hospitals were linked into SijariEMAS, in reality only one of these received emergency maternal and neonatal referrals, with the other focusing on normal deliveries. A total of 10 puskesmas were linked to the hospital through SijariEMAS. Six additional puskesmas were recently incorporated in the PK and SijariEMAS system.
- [23] E.g. ICT Working Group, Health Office, Hospital, Health Center & Professional Organization (IBI).
- [24] Motivator Kesehatan Ibu dan Anak - MKIA are Muhammadiyah/AISYAH members at the village level who are working with pregnant women to encourage positive health outcomes.
- [25] emergency room, maternal, and perinatal wards
- [26] Although SijariEMAS was piloted in September 2012 and officially launched in December 2012
- [27] As of early 2015, Phase 3 districts are currently developing PKs, which underpin SijariEMAS, but have not yet began implementing the SijariEMAS system.
- [28] Tegal District initially implemented the Standard Model, but moved to the Optimal Model with a call centre in 2014. In year 3, the DHO and RSUD Soesilo agreed to establish a 24/7 call centre.
- [29] Ten in Year 3 and the remainder in the first quarter of Year 4
- [30] Jaminan Kesehatan Nasional, administered by the Social Security Administration for Health (Badan Penyelenggara Jaminan Sosial [BPJS] Kesehatan).
- [31] With this data it is important to note that the numerator is the total percentage of cases managed with SijariEMAS, whereas the denominator reflects all maternal and newborn referrals (emergency and non-emergency) across the whole catchment area, regardless of whether or not the referral originated from an EMAS-supported puskesmas.
- [32] Data for Asahan, Bogor, and Karawang districts was still being validated at the time of this report.