ABSTRACT

Title of Document: DESIGNING A DECISION-MAKING SYSTEM FOR PROVIDING MUTUAL AID DURING DISASTERS

Sana Tabrez Shaikh, MS in Systems Engineering, 2007

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Routine organizational decision-making is a complex process, but organizations have procedures in place to support decision-making for routine situations. However, when an organization faces a crisis, the standard processes in place may not be enough to react appropriately to the crisis. Sometimes, due to the scale of the crisis and the resources needed, organizations may need to collaborate with other organizations to ensure success. This thesis addresses the design of such a mutual aid system as a type of a decision-making system. Our approach is based on the Operational Procedure Model used in avionics for specifying the dynamic behavior of operationally embedded reactive software-based systems. Using this approach, we designed and tested a mutual aid system to be used by five hospitals in Montgomery County, Maryland. Based on this experience, we propose a revised methodology for designing crisis decision-making systems.

# DESIGNING DECISION-MAKING SYSTEM FOR PROVIDING MUTUAL AID DURING DISASTERS

By

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# Chapter 1: Introduction

## *1.1 Medical Disaster Mutual Aid Problem*

"The attacks on 9/11 demonstrated that even the most robust emergency response capabilities can be overwhelmed if an attack is large enough. Teamwork, collaboration, and cooperation at an incident site are critical to a successful response" (Kean and Hamilton, 2004).

This statement from the 9/11 Commission Report clearly demonstrates the need for robust emergency response to a large-scale man-made disaster. The threats of large-scale man-made disasters and natural disasters require contingency plans to support activities during disasters. Many such disasters result in a large number of people requiring some kind of medical aid. This may also result in an imbalance in the supply and demand of medical resources (human resources, pharmaceuticals, and equipment) required for mutual aid. Hospitals handle emergencies as a part of their routine operations. However, when they have to face large-scale disasters, they might not have enough resources to handle the demand of the situation by their own. Examples of such situations could be:

- A hospital may run short of critical pharmaceuticals, supplies, or equipment.
- A hospital may need additional staff to treat the surge of patients.
- A hospital may need to transfer established patients to make room for those who are critically injured.

In such situations, it makes sense to collaborate with other healthcare organizations and get aid to obtain enough resources to handle the situation. In order to make this mutual aid process possible, it is important that the hospitals, healthcare organizations as well as the governmental agencies responsible in such situations agree to get together with a mutual understanding to provide medical aid to people who need the support.

According to Quarantelli (1983), many of the logistical problems faced in disasters are not caused by shortages of medical resources but rather from failures to coordinate their distribution. So, it also becomes necessary to define processes to handle the situations that arise to support the non-routine decisions that the different organizations need to make and to make the process of mutual aid as efficient as possible. We have designed a decision-making system that addresses this issue of co-ordination and the sequence of the processes to handle the disaster situation successfully. We have done this by defining operational procedures to support the various non-routine processes that would be carried out by organizations collaborating to provide mutual aid.

### *1.2 Type of Decision Making System Design Problem*

The decision-making system that we are studying is unlike general decision-making systems that are based more on quantitative measures and calculations. Such systems usually allow one to select the best possible alternatives given a model that can evaluate the performance of each alternative. However, in the case of designing a decision-making system for mutual aid during disasters, there is very little that can be

predicted. Only general ideas about the possible scenarios and available actions can be identified. Limitations of this kind make designing such a decision-making system a relatively challenging task.

## *1.3 Overview of Thesis*

Here, we outline the various sections of the thesis.

Chapter 2 reviews previous work done in designing decision-making systems. It covers decision-making in a crisis and the Operational Procedure Methodology. Chapter 3 discusses the Emergency Mutual Aid problem. We state the problem and discuss the problem formulation. Chapter 4 presents the approach followed for solving the problem. It describes in detail the improvement workshop and the tabletop exercise. The chapter goes into detail about the operational processes developed for MOCEP. Chapter 5 evaluates the approach followed for designing the decision-making system and suggests improvements. Chapter 6 summarizes the paper and proposes a model to design crisis decision-making systems. It also recommends future work that could be undertaken for further improvement.

# Chapter 2: Background

This chapter reviews previous work done on designing decision-making systems in general and under crisis. It also reviews the Operational Procedure Model (Sherry and Ward, 1995), on which we based the approach we followed for the project.

## *2.1 Designing Decision Making Systems*

Decision-making can be considered as a process of choosing among alternative courses of action for the purpose of attaining a goal or goals (Turban and Aronson, 1998). Different courses of action are analyzed to come up with an optimum course that satisfies the goal(s) of the organization.

The most popular models of the decision-making process are based on Simon's model of three phases: setting the agenda, representing the problem and finding and selecting alternatives (Simon, 1997, first reported in "Administrative Behavior", 1947) and recent extensions (Mora et al. 2003). Table 1 summarizes the extended five-phase model.

**Table 1: Decision-Making Phases and Steps**

| **Phase** | **Step** | **Description** |
|---|---|---|
| Intelligence<br><br>(Simon's "setting the agenda" step) | Data Gathering | Observation of the current process (if any) or the process background |
| | Problem Recognition | Based on the observation, a well-defined problem statement and general objectives |
| Design<br><br>(Simon's "representing the problem" step) | Model Formulation | Using the well-defined problem, a predefined model is generated with a set of courses of action etc. If a predefined model is unavailable, a new model must be developed |
| | Model Analysis | Validation of the model should be conducted to reduce any potential errors |
| Choice<br><br>(Simon's "finding and selecting alternatives" step) | Generation and Evaluation | Evaluate and analyze all courses of action |
| | Selection | Best course of action is finally suggested, using an optimization, satisfaction criteria, or other approach |
| Implementation | Result Presentation | Selected course of action is reported to top management team for final authorization ( a decision can be taken, but not implemented) |
| | Task Planning | Decision authorized, is scheduled in a set of specific actions, where financial, human and material resources are estimated |
| | Task Tracking | The set of specific action are conducted and monitored until the planned end action is achieved. |
| Learning | Outcome-process Analysis | Process and outcomes metrics are collected from decision-making team and organization |
| | Outcome-process synthesis | Learned lessons on the decision-making process are identified and communicated to the top management team |

Decision-making is a continuous and iterative process (Simon, 1997). A later phase usually gives feedback to the previous one until an optimal solution is reached. But normally, the phases occur sequentially as mentioned.

There are two generalized categories of decision-making: Individual decision-making and organizational decision-making. Both of these are focused on making effective decisions for a particular objective and they are similar in that aspect. However, in the case of organizational decision-making, the process becomes more complex because the perspectives and viewpoints of all the parties involved need to converge in order to make any kind of decision. In addition, people involved in organizational decision-making are usually trying to solve problems on a larger scale. Although individual decision-making may be improved by just focusing on one individual's decision making-process, it would take a significantly larger effort to improve organizational decision-making. The mere fact that more than one person is involved in the process makes it more complex in case of organizational decision-making.

Huber and McDaniel (1986) discuss some general design guidelines to improve the quality of organizational decision-making. Some of the design guidelines they discuss are:

1. Create a degree of specialization among decision-making units that is commensurate with the complexity of decision situations encountered;
2. If both routine and non-routine decisions must be addressed, create and formalize a dual structure, one with rigid processes for routine decisions and other with flexible processes for non-routine decisions;

3. Design sensor units and message handling units and system – ensure that sensor and message handling units make appropriate decisions concerning non-routine or unanticipated messages.

Though these are only qualitative guidelines, they are very helpful in generating frameworks for designing decision-making processes. They are especially useful in designing decision-making systems that are difficult to model quantitatively and as a result even more difficult to give a measure of performance.

## *2.2 Crisis Decision-Making*

Crisis decision-making becomes necessary when the organization faces a situation that is unusual in nature. The situation is not part of the day-to-day activities of the organization(s) involved even though it might usually be something that can be anticipated in some degree.

The key decisions in crises are usually made by a smaller number of individuals (Smart and Vertinsky, 1977). This group needs to make many major decisions in a relatively small period of time and are, therefore, under a lot of stress.

In such a situation, in order to make the decision-making process efficient and effective, the group should consist of people having expertise many areas.

Many factors affect the quality of decision making during crisis. Some of them are selective attention, information distortion, groupthink and resistance/readiness to change (Smart and Vertinsky, 1977). Most of these can be overcome with proper

planning during the initial phases of the decision-making process. Selective attention can be controlled by considering all of the possible situations the group may need to handle. Information distortion, on the other hand can be controlled by using special formats for presenting and processing information and using special communication channels. Group think can be avoided (or curbed) by setting up anonymous channels of expressing opinions (Delphi technique) and setting up independent resource and capability appraisals. The readiness of the organization to make important decisions during a crisis can be supported by creating contingency plans and thinking about all of the possible scenarios.

### *2.3 Operational Procedures*

The approach that we followed to design a decision-making system for mutual aid between hospitals in case of medical disasters was based on the Operational Procedure Model (Sherry and Ward, 1995). The Operational Procedure Model (OPM) is used for specifying the dynamic behavior of operationally embedded reactive software-based systems. The OPM can be used in place of general state machine models in the description of dynamic behavior in both functional specifications and object-oriented specifications.

The entity-relationship-attribute model of the specification constructs of the OPM is illustrated in Figure 1. The model consists of two classes of constructs: constructs that represent a conceptual description of the user's view of the system, and constructs that are defined by the mission-relevant physical input states and outputs of the system.

The operational procedures are invoked in specific situations in the mission to perform a set of specified actions. The scenarios define the situations in the mission in which the operational procedure is invoked. The behaviors define the actions that are performed on a specified object to achieve the objectives of the mission.

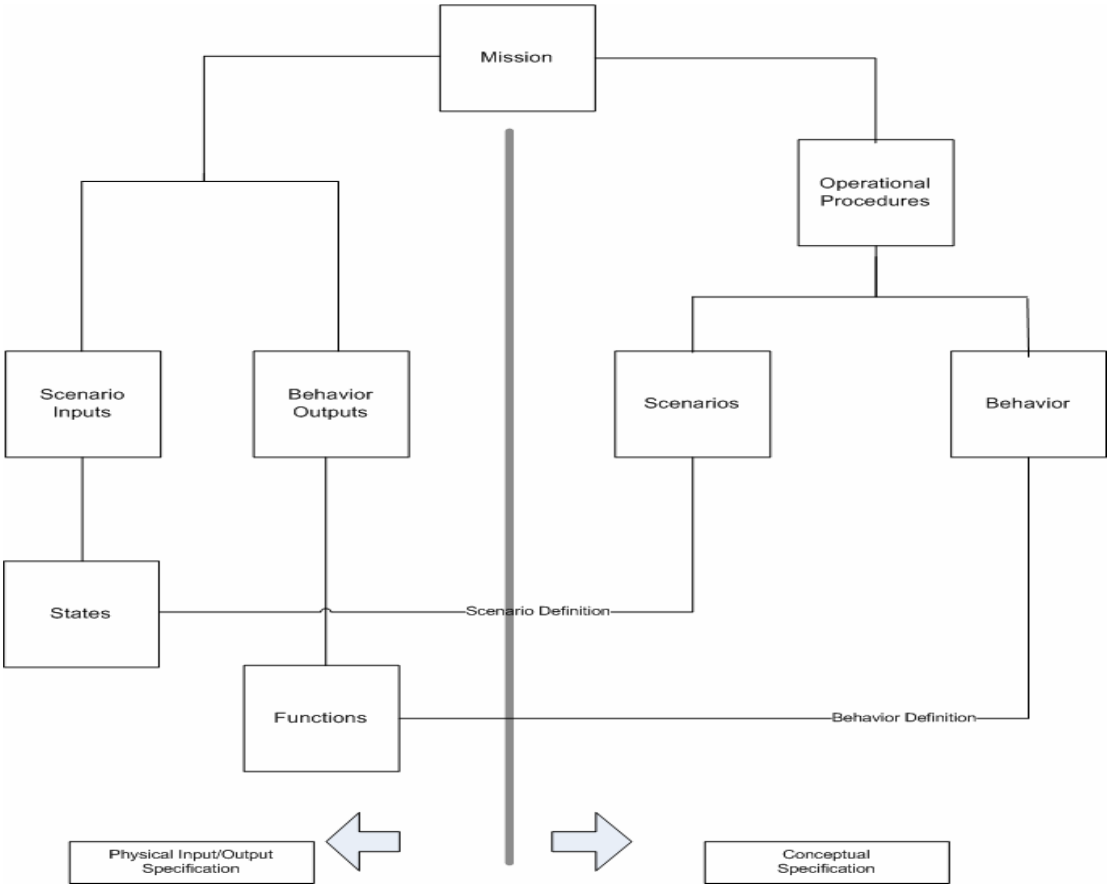



**Figure 1**: **The Operational Procedure Model**

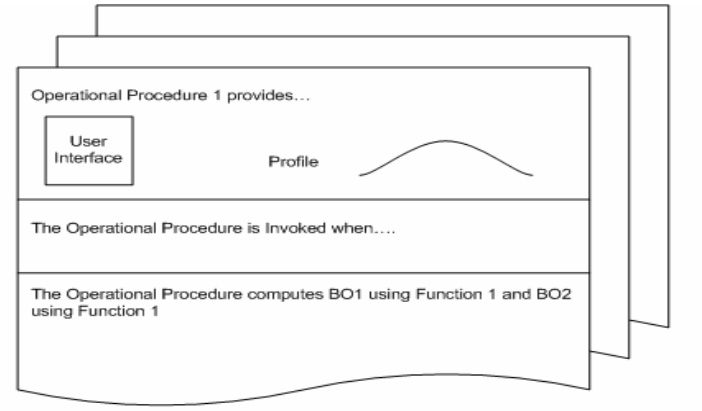
The OPM can be visually interrogated and populated in well-known textual, tabular and graphical specification notations (see Figure 2). The tabular representation,

known as an Operational Procedure Table is used by end-users and designers of the system

We can take an example using the OPM to develop aircraft vertical flight guidance training material (Feary et al, 2000).

The users of the system use the operational procedure cells to define what they would like the aircraft system (including autopilot and flight management system) to do (e.g. climb, cruise or descend). Inside each operational procedure, the users describe a number of scenarios. These descriptions are used to define the various situations an aircraft may need to cope with. For example, when climbing an aircraft may have an engine failure, and the system may need a behavior to deal with it. The behaviors and behavior descriptions describe how the user would like the aircraft to handle the defined situation. For example, if there is a failed engine during climb, the user may want to the autopilot to pitch the airplane for a particular speed. The inputs, outputs, states and functions are completed by the design engineers and define the parameters that will satisfy the needs of the users. Examples of scenario inputs are altitude, airspeed and weight, and examples of behavior outputs are pitch –thrust commands and targets.

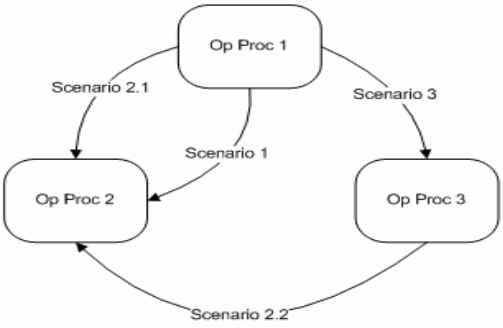
In this thesis, we are only concerned with only the conceptual specification part of the OPM, i.e. the scenario and behavior descriptions and the operational procedures. The conceptual specification defines a mission by a set of *operational procedures* that are invoked to achieve the objectives of the mission. In case of the current project, the physical inputs and outputs of the systems are pre-defined.




a) Textual Specification

| | Op Procs | | Op Proc 1 | Op Proc 2 | | Op Proc 3 |
|---|---|---|---|---|---|---|
| Scenarios | Inputs | States | Scenario 1 | Scenario 2.1 | Scenario 2.2 | Scenario 3 |
| | SI 1 | s1 | s1 | | | s1 |
| | | s2 | | s2 | s2 | |
| | SI 2 | s1 | s1 | | | |
| | | s2 | | | s2 | s1 |
| | | s3 | | s3 | | |
| | From Op Proc | 1 | | 1 | | 1 |
| | | 2 | 2 | | | |
| | | 3 | | | 3 | |
| Behaviors | Outputs | Functions | Behavior 1 | Behavior 2 | | Behavior 3 |
| | BO 1 | f1 | f1 | f1 | | |
| | | f2 | | | | f2 |
| | BO 2 | f1 | f1 | | | |
| | | f3 | | f3 | | |
| | | f4 | | | | f4 |

b) Operational Procedure Table




c) Graphical Specification

**Figure 2: Specification Notations**

## *2.4 Summary*

The background research on decision-making in general and for crises provides a very generic idea about what a decision-making system should look like. However, it does not tell us specifically what framework can be used. We can combine all these with the OPM methodology and come up with a framework that organizations can use to provide mutual aid in case of major disaster. We think that the approach based on OPM is adaptable to crises because we can compare a crisis to an embedded reactive system.

# Chapter 3: Problem Setting

## *3.1 Background for Emergency Mutual Aid System*

In 2001, a group of hospital CEOs created a collaborative group to coordinate an emergency response plan. The Montgomery County Healthcare Collaborative on Emergency Preparedness (MOCEP) was established to create greater collaboration among the five Montgomery County, Maryland hospitals (Holy Cross Hospital, Montgomery General Hospital, Shady Grove Adventist Hospital, Suburban Hospital, Washington Adventist Hospital), Montgomery County's Department of Health and Human Services (DHHS), Public Health Services (PHS), Montgomery County Fire Rescue Service (MCFRS), and Kaiser Foundation Health plan of the Mid-Atlantic States.

MOCEP has signed a Memorandum of Understanding (MOU), which is a voluntary agreement among the hospitals and other health service providers in Montgomery County, Maryland, to provide mutual aid at the time of a "Medical Disaster."

A Medical Disaster is defined as an overwhelming incident that exceeds the effective response capability of the impacted Participating Healthcare Organizations.

The MOU also describes the relationship between the Participating Healthcare facilities and the Montgomery County Fire Rescue Service, the Montgomery County Department of Health and Human Services ("Local Government Services") through public health services and through the individual Participating Hospitals affiliation

with area-wide communication system established by the Maryland Institute of Emergency Medical Services System (MIEMSS).

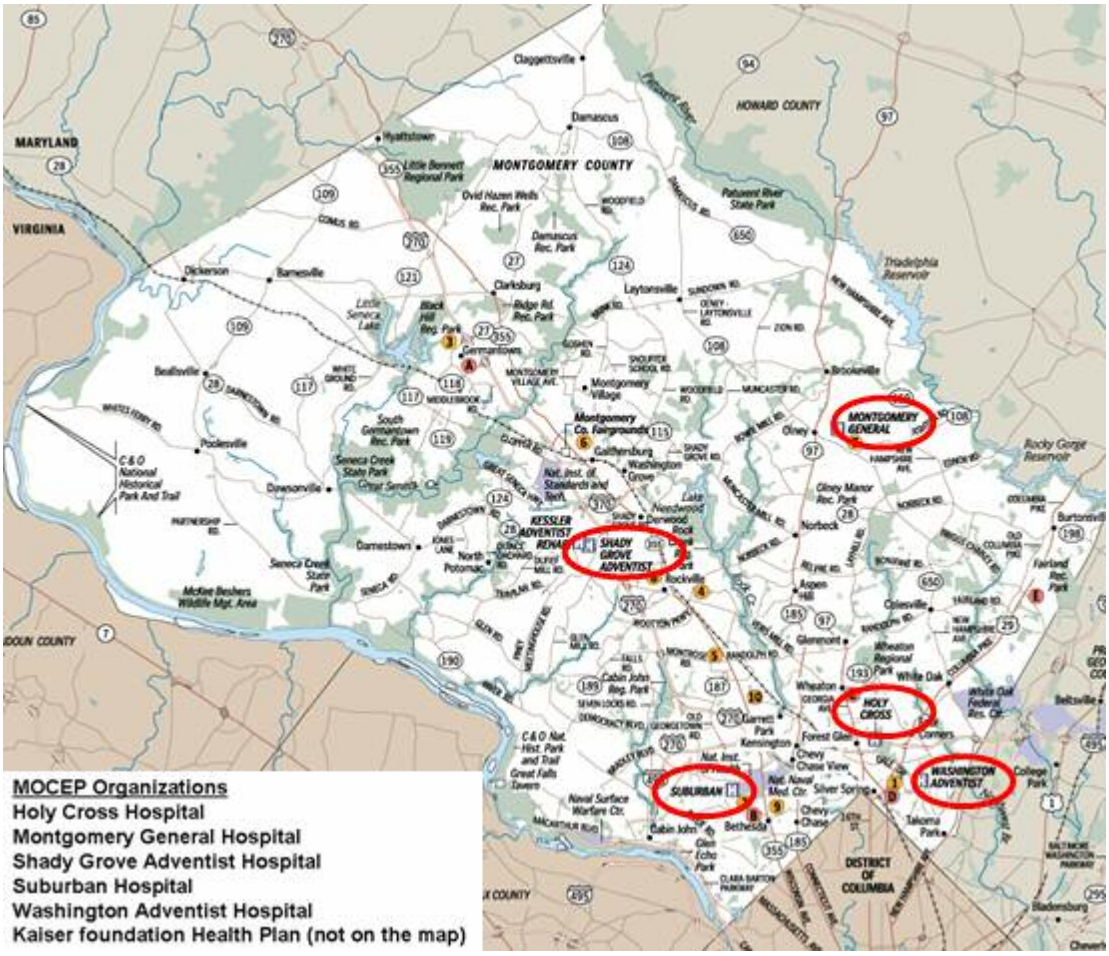



**Figure 3: MOCEP Organizations on Montgomery County Map**

*3.2 Problem Statement*

The Request for Proposal (RFP) by MOCEP for a project to operationalize their MOU states the goal of the project as: The overall goal of this project is to develop an operational procedures methodology to implement the MOCEP MOU and individual entity emergency plans for facility collaboration with surge capacity planning.

The key areas of the MOU that needed be operationalized were:

a. Communication between healthcare facilities and county agencies

b. Activation of Emergency Mutual Aid System (EMAS)

c. Mutual aid received by or provided to a participating healthcare facility including:

- Authority and communication
- Volunteer personnel
- Transfer of resources including pharmaceuticals, supplies, or equipment

d. The transfer or evacuation of patients including:

- Communication and documentation
- Transporting patients
- Supervision
- Notification

e. Auxiliary hospital and casualty collection locations

f. Media relations and release of information

### *3.3 Problem formulation*

We will first set a decision context for the problem. The main objective of the hospitals and other organizations involved is service. The problem that we are trying to solve also has its context in line with that larger context, but it just focuses on what

"else" to do in case of a situation needing mutual aid. The decision context does not include specifications of "how" the routine processes of those organizations function, but only "what" to do in case of a disaster situation.

Let us consider this problem as a standard optimization problem and analyze it in terms of the standard elements of decision-making: objective(s), variables and constraints

Objectives:

- Make effective decisions to provide mutual aid in case of disaster situations,
- Make quick decisions to provide mutual aid in case of disaster situations,
- Design the system such that it is easy for the participants to switch from their processes to the non-routine decision-making processes.

Variables:

- Modes of information flow between the different organizations,
- Modes of communication set up between the organizations,
- Number of participants involved in the decision-making,
- Different roles assumed by participants and organizations depending on the situation at hand.

Constraints:

- The capability of the organizations to handle disasters of specific nature.
- The existing Hospital Incident Command system for the organizations that is used to handle "routine" emergencies.
- The participation of Kaiser Permanente in the mutual aid system and the differences of its operations from the hospitals.

- The compatibility of the new processes to the processes currently used by the organizations.
- The extent of involvement of other governmental organizations.

In addition, for the success of such a mutual aid system, we need to assume a good level of cooperation between the organizations involved. This means that all these organizations are willing to work together to attain the same goal. The cooperation becomes easier if the organizations share similar values.

We can see that this problem is just an example of a larger class of problems in designing decision-making systems. This problem would fall in the class of problem in which decisions need to be made for non-routine tasks that need to be carried out apart from, or in conjunction with, the routine processes. Simon (1958) says that well-structured problems can be formulated explicitly and quantitatively. As a consequence, they can be solved by known and feasible computational techniques. For ill-structured problems, the essential variables are symbolic or verbal rather than numerical. Moreover, the goals are vague and non-qualitative. Our problem definitely fits in the ill-structured problem category.

We have to design the model of a decision-making system to meet the defined objectives, considering all the variables and constraints. This system should provide a framework for the organizations to make effective decisions and eventually be able to carry out mutual aid operations successfully.

# Chapter 4: Approach

## *4.1 Overview of the Approach*

The overall mission of this research was to generate procedures to successfully provide mutual aid during medical disaster. We followed the operational procedure methodology based on the operational procedure model.

We met with representatives of the organizations and discussed their current procedures. We also studied different emergency preparedness activities and guidelines followed by other government and healthcare organizations. We also studied the Hospital Incident Command Systems (HICS) and organizational structures of the organizations in MOCEP. Each hospital and organization has its own system in place to handle "routine" emergencies that they can handle themselves without any aid from other organizations.

The operational procedures were based on the HICS used by the organizations to provide mutual aid in case of disaster situations. These procedures are to be used in addition to the regular process the organizations follow in their routine day-to-day operations. Each operational procedure has the following components:

1. Title: Identification number for the procedure and name of the procedure
2. Overview: Overview of the operational procedure
3. Scenarios: This section tells when the operational procedure should be invoked and the definitions of the various roles
4. Goal: States the goal of the operational procedure
5. Roles: The roles involved in a particular operational procedure

6. Decision-making process: A diagrammatic depiction of the operational procedure in the form of a process diagram using swim lanes for different roles. The links between the processes also show the mode of communication used (e.g. dial-in line, HRN).
7. Task Details: The step-by-step details of the tasks involved in a particular procedure.
8. Options: Optional flows of communication given a change in scenario
9. Job Action Sheet: Task details for each role involved in the operational procedure
10. Standardized document formats: Document formats were designed for information sharing and reference for various operational procedures.

In addition to the decision-making process diagram, we also created Job Action Sheets denoting what each role does for a specific operational procedure. A reference sheet including the process diagram and the roles involved in each operational procedure was also created which could be laminated and included in the reference file for the HICS.

The approach that was followed to create and test the operational plan is given below.

1. We used the operational procedure methodology to define various scenarios that could occur and defined operational procedures to implement these scenarios. We developed these detailed procedures from the outlines of the current procedures defined in the MOU.

2. We defined the decision-making processes for these procedures and the roles and responsibilities of the people involved.

3. Many different modes of communication (e.g. conference phone line, Hospital Radio Network (HRN) and information systems (e.g. Facilities Resources

Emergency Database (FRED)) were available and being used by the MOCEP organizations. Since multiple communication paths between the Emergency Operations Center (EOC) and the emergency rooms (ERs) of the various participating organizations and hospitals existed, we defined processes for how exactly the communication would be established and maintained during a disaster situation.

4. Operational procedures developed had detailed steps for the processes. These details were gathered during a weekly conference call with the MOCEP representatives. The representatives gave valuable inputs in defining and designing the processes. We also generated process diagrams drawn as swim lanes for each role. These diagrammatically depicted decision-making processes provided a visual tool for familiarizing the organizations with the procedures. We generated job action sheets for each role of each procedure for reference by individuals assuming those roles in case of a disaster situation. We also designed various standardized formats for information collection were to support execution of some operational procedures

5. We improved the operational procedures during a workshop that brought together the organizations involved representatives from the MOCEP organizations and the design team. The designs were reviewed and we updated them based on the inputs received from the MOCEP representatives.

6. The final version of the operational procedures was tested by a tabletop exercise. The exercise provided the validation of the plan as well as the approach used to create the procedures.

An example of a complete operational procedure can be seen in *Appendix A*

## *4.2 Improvement Workshop*

**Figure 4: Improvement Workshop**

We conducted an improvement workshop with the representatives of the organizations in MOCEP. About 10 representatives from the MOCEP organizations and the University of Maryland Project Team were present for the workshop. The goal of the workshop was to get all the people together and review the operational procedure with an aim to improve the processes in the operational procedures. During

the workshop, we went through all the proposed operational procedures using the decision-making process diagrams and made improvements to the processes as shown in Figure 5. This exercise helped to a certain extent to verify the operational procedures and improve them based on the discussions. This was more of a review exercise than a test because we did not simulate the decision-making process for any specific disaster situation.

# OP-3B

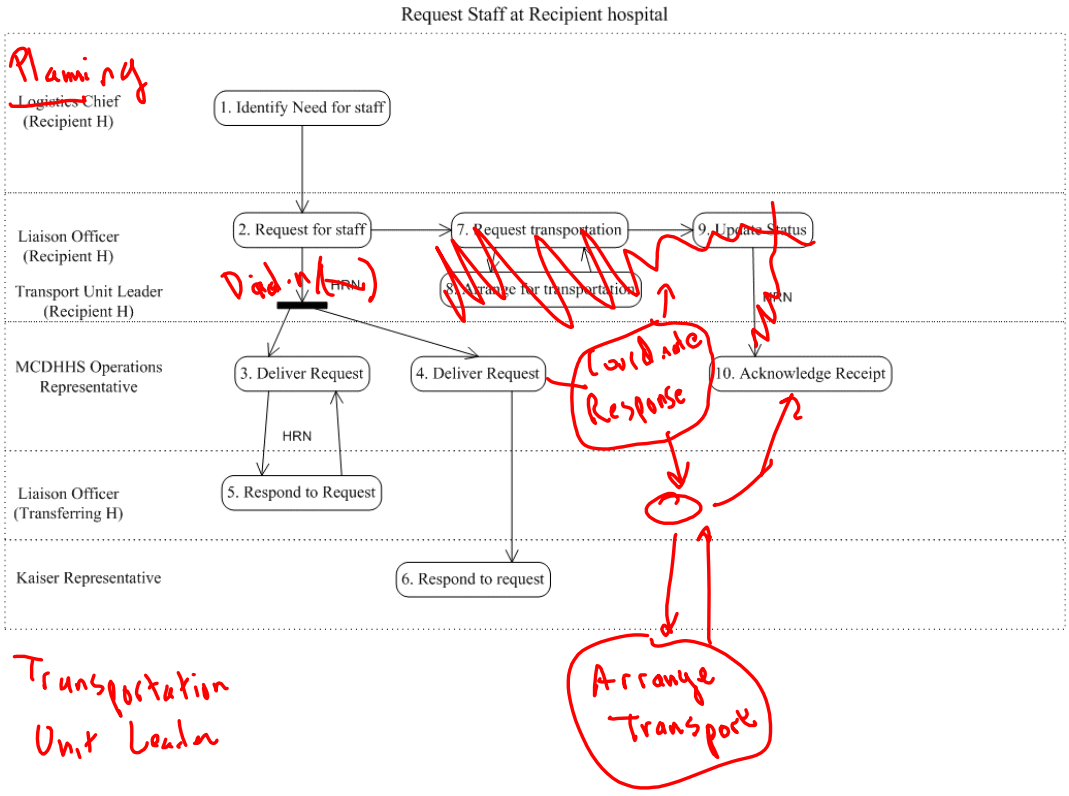



**Figure 5: Updating the OP-3B during the improvement workshop**

We collected useful feedback and many practical ideas during the improvement workshop and updated the processes and documents accordingly. It also helped define the scope of certain scenarios. For example, the evacuation of an entire hospital becomes a county disaster, and so it is out of scope for EMAS. Another outcome of this process was the generation of document formats to support information sharing during the decision-making process. We submitted a final version of all operational procedures, which served as a basis for the tabletop exercise carried out to validate the decision-making system. The MOCEP representatives trained members of their organization on the entire process.

### *4.3 Tabletop Exercise*

A tabletop exercise is a method used to study the response of participants (participating organizations) to a simulated disaster. The participants are those who participate if the disaster actually occurred. The purpose of such an exercise is usually to promote emergency preparedness of organizations and improve their processes if required. Tabletop exercises have been known to be really successful in emergency preparedness exercises. The tabletop exercise is led by a facilitator who is usually a subject matter expert. The facilitator ensures that the exercise meets its schedule and achieves the defined objective. For a discussion of best practices for tabletop exercises, see Olivo (2007).

**Figure 6: MOCEP Table Top Exercise (Jester II)**

The tabletop exercise was carried out to validate the decision-making system using the operational procedures. It was organized and led by Kathleen Henning (of KGHenning & Associates, LLC). At the tabletop exercise for MOCEP (called Jester II) more than 70 individuals from the MOCEP organizations, responsible for various decision-making roles participated. Also participating were representatives from other counties, government agencies, neighboring jurisdictions, observers (including the design team) and other invited guests. The simulated event was a multi-hazard event including severe weather, power outages, auto collisions, a media event, a mass-casualty transportation accident, and the release of a hazardous material. The MOCEP organizations were able to simulate the response to the event using their experience along with support of the EMAS using the operational procedures. The organizer of

the tabletop exercise, Kathleen Henning collected feedback for all the participants regarding the tabletop. Based on the exercise and feedback from the participants an After Action Report was generated. A major recommendation of the report was the need for additional training of the hospital staff on their internal procedures as well as the operational procedures for EMAS in preparation for a multi-jurisdictional regional exercise scheduled for later in the year. As per the After Action Report, the exercise was largely considered a success. It met the objective of identifying key coordination and critical operational during activation of EMAS. It resulted in the updation of the Mutual Aid Plan and job action sheets and helped the participants prepare for an upcoming regional exercise. The strengths and weaknesses of the various communication methods available to them during events were also evaluated as a result of the exercise. The exercise helped build depth in the operations performed by the participants including individuals with minimal experience in mutual aid events or in their assigned HICS roles. The standard formats designed with the operational procedures were used for requesting and tracking resources and their use helped bring out the differences between routinely shared pharmaceutical supplies and staff and equipment. The tracking of staff and equipment using the standard format needs to be explored further. As a part of the exercise critical information was received from the county representatives regarding access and availability of generators.

As per the After Action Report, the coordination and agreement between the hospitals to provide mutual aid, share resources, and utilize the Liaison Officers during the conference calls after activation of EMAS was the best feature of the exercise.

*4.4 Operational Procedures*

After discussions with the MOCEP representatives, we proposed to organize the operational procedures into four "phases":

1. Activation,
2. Launch,
3. Operations, and
4. Deactivation.

1. Activation**:** The Activation phase refers to the period immediately following the incident. One or more hospitals may be receiving (or preparing to receive) patients, but the participating hospitals have not yet activated the Emergency Mutual Aid System (EMAS).

This phase has only one relevant operational procedure:

- Activate Emergency Mutual Aid System (EMAS)

2. Launch**:** The Launch phase begins upon activation of the EMAS. All Participating Hospitals have activated their Hospital Incident Command Systems (HICS). The Launch phase is a period where the hospitals establish communication links and share key information.

This phase has three relevant Operational Procedures:

- Establish Disaster Management Communication Links

- Collect Disaster Management Information
- Establish Joint Public Information Center

3. Operations**:** The Operations phase begins when Participating Hospitals begin requesting mutual aid and continues throughout the incident. Operational Procedures are invoked when necessary.

This phase has many relevant Operational Procedures:

- Request Pharmaceuticals, Supplies, or Equipment (PSE)
- Request Staff at a Recipient Hospital
- Request Transfer of Patients to a Participating Hospital
- Coordinate Roadway Traffic Control Plan to Support Patient Transfer
- Setup Auxiliary Hospital or Casualty Collection Location
- Request Staff for an Auxiliary Hospital or Casualty Collection Location
- Accept Volunteer Staff

4. Deactivation**:** The Deactivation phase begins when the operations related to the incident are complete and further mutual aid is not necessary.

This phase has only one relevant Operational Procedure:

- Deactivate Emergency Mutual Aid System (EMAS)

These procedures define the process to be followed in case of crises. The operational procedures act as tools to handle a crisis.

The eleven operational procedures we created are as follows:

1. OP 1A - Activate Emergency Mutual Aid System (EMAS): This operational procedure should be used to invoke the EMAS. This operational procedure is intended to prompt the participating healthcare facilities to activate their Hospital Incident Command System (HICS) to provide mutual aid. The Administrator(s) on Call (AOC) of all the participating healthcare facilities and the Montgomery County Department of Health and Human Services (MCDHHS) are notified by the emergency departments and the AOC(s) activate the HICS on the directions of the Incident Commander of the affected hospital.
2. OP 2A - Establish Disaster Management Communication Links: This operational procedure should be invoked immediately following the activation of EMAS and HICS at each participating hospital. This operational procedure is intended to establish the communication links needed to request and process requests for mutual aid. The Liaison Officers of the participating healthcare facilities and the MCDHHS representative get on the Hospital Radio Network (HRN) to set up the emergency dial-in line to be used for further communication. The Command Hospital is decided on a rotational basis.
3. OP 2B - Collect Disaster Management Information: This operational procedure should be invoked once the communication links have been established between the organization after the activation of the EMAS. This operational procedure is intended to provide critical information about the crisis to the Emergency Medical Resource Center (EMRC), Emergency Operation Center (EOC) and participating healthcare organizations. The Incident Commander and the Liaison Officer of the affected hospital identify the type of disaster. They then share the information

about the event and the estimate of casualty with the Liaison Officers at the other participating healthcare organizations. The Planning Chiefs of the participating healthcare organizations also provide the updated bed availability information to the Liaison Officer of the affected hospital.

4. OP 2C - Establish Joint Public Information Center: This operational procedure should be invoked immediately following the activation of the EMAS. This operational procedure is intended to establish the Joint Information Center (JIC) so that public relations personnel for each organization communicate with each other and release consistent educational and advisory messages to the public via the media. The Montgomery County Public Information Officer (PIO) gets together with the PIO(s) of other participating healthcare organizations and establishes the JIC.
5. OP 3A - Request Pharmaceuticals, Supplies, or Equipment (PSE): This operational procedure should be invoked when the inventory of some pharmaceuticals, supplies, or equipment (PSE) at a hospital becomes or is anticipated to be insufficient for taking care of patients during a medical disaster. This operational procedure is intended to increase the inventory of the requested PSE at the hospitals which need them, to a level sufficient for handling patients. The MCDHHS operations representative helps coordinate the request of PSE between the Logistic Chiefs of the requesting and supplying hospitals through the Liaison Officers. The requests are processed and tracked using the Resource Request and Accounting Record (RRAR). We designed the format of the RRAR

form was based on discussions with the MOCEP representatives. It is displayed in Appendix B.

6. OP 3B - Request Staff at a Recipient Hospital: This operational procedure should be invoked when staff present at the hospital needs additional assistance in treating patients (both those already admitted and those expected to arrive) during a medical disaster. It should also be invoked when an Auxiliary Healthcare treatment site needs to be set up in case of prolonged disasters. This operational procedure will usually be invoked if only one hospital is impacted by the disaster. It is intended to get additional staff required for attending and treating patients during a Medical Disaster. The MCDHHS operations representative co-ordinates the request and for additional staff between the requesting hospital and the responding healthcare organizations. The transport unit leader at the responding healthcare organization arranges for the transportation of the additional staff.
7. OP 3C - Request Transfer of Patients: This operational procedure should be invoked when the number and type of patients (both those already admitted and those expected to arrive) at a participating hospital becomes or anticipated to become too great for the hospital to treat during a medical disaster and implementing the hospital's internal surge plan will be not be adequate. This operational procedure should be invoked when only one hospital is impacted and the number of patients to be transferred is small. Scenarios that require transferring a large number of patients are beyond the scope of the EMAS and require utilizing state-level disaster management plans. This operational procedure is intended to assign patients that need to be transferred to other

facilities (participating healthcare organizations or Auxiliary Healthcare Treatment sites) for treatment. The medical director at the affected hospital identifies the need for transferring the patients to other facilities. The MCDHHS operations representative coordinates the efforts of making a transfer plan with the Incident Commanders and Liaison Officers

8. OP 3D - Coordinate Patient Transfer: This operational procedure should be invoked when a participating hospital in the event of a medical disaster needs to transfer patients to another facility. This operational procedure will follow the OP-3C Request Transfer of Patients. It assumes that the affected hospital has requested transfer and that the MCDHHS Operations representative has identified the assisting hospital(s) to which patients will go. This operational procedure is intended to develop and execute plans to transport patients from one hospital to another. This will required only if one facility is not able to arrange to transportation. The Liaison Officer at the affected hospital co-ordinates the request for transportation with the EMRC which then responds with the availability of vehicles and arrange for transportation.
9. OP 3E - Setup Auxiliary Healthcare Treatment Site (AHTS): This operational procedure should be invoked in the event the medical disaster overwhelms the participating hospitals' capacity and an Auxiliary Healthcare Treatment site is needed to provide additional capacity to treat casualties. This operational procedure is intended to help plan the setup of an AHTS. The Incident Commanders identify the need for an Auxiliary Healthcare Treatment Site and,

along with Liaison Officers and the MCDHHS operations representative plan about the details of setting up the AHTS.

10. OP 3F - Accept Volunteer Staff: This operational procedure should be invoked after a hospital has requested additional staff to handle the medical disaster. This operational procedure is intended to allow a recipient hospital to accept volunteers and to verify that they are certified, licensed, privileged or credentialed. Once the volunteers reach the recipient hospital, they are required to provide proof of licensure which is verified by the Chief of Planning at the hospital. The Chief of Planning assigns the location of work to the volunteers and the Supervisors provide them with Just-In-Time training and assign duties to the volunteers. The volunteers' time also tracked by the Time Unit Leader.
11. OP 4A - Deactivate Emergency Mutual Aid System (EMAS): This operational procedure should be invoked when the operations related to the medical disaster are complete (or nearing completion) and further mutual aid is not necessary. This operational procedure is intended to cease mutual aid operations. The Incident Commander at the Command Hospital proposes deactivation of EMAS. The deactivation is discussed between the Incident Commanders of the participating healthcare facilities and the MCDHHS operations representative. The Logistic Chiefs at the participating hospitals return and reconcile unused supplies and equipment. The Finance Chiefs identify and capture costs and the Planning Chiefs track staff assignments. The Finance Chiefs determine financial reimbursements for the resources. The Incident Commanders at the Participating Hospitals debrief the staff after the disaster has been handled. The HR Sections Chief at the

Participating Hospitals debrief the staff for critical incident stress management after the disaster has been handled.

An example with all the details of an operational procedure can be seen in Appendix A.

### *4.5 Decision-making process diagram*

Each operational procedure has a decision-making process diagram associated with it. Consider Figure 7 as an example of the decision-making process diagram for OP-3A: Requesting Pharmaceuticals, Supplies or Equipment. The process diagrams are loosely based on activity diagrams in UML and are drawn using Microsoft Office Visio 2003 Professional Edition. The process diagram has been divided into swim lanes horizontally. Each swim lane separates activities for each role clearly. The activities are also numbered to indicate the sequence of the activities. The links between the activities are appropriately labeled based on the mode of communication (e.g. dial-in line, HRN).

These diagrams provide a clear way to represent the activities and the people involved. They were very appreciated by the MOCEP representatives because, once they became familiar with the diagram, they could use the diagram as a quick reference to understand the whole process.

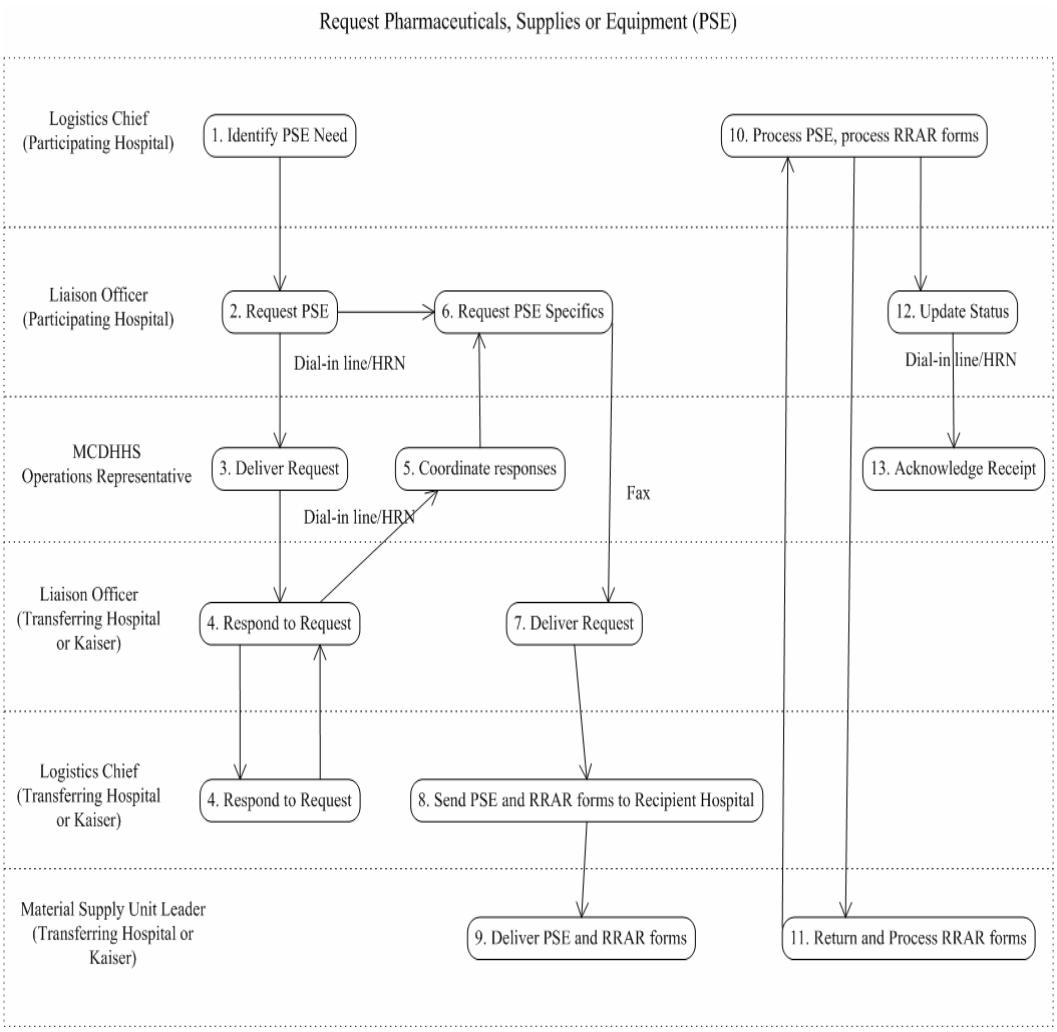



**Figure 7: Decision-making process for OP-3A: Requesting Pharmaceuticals, Supplies or Equipment**

## *4.6 Summary*

This chapter presented the methodology used to define the operational procedures. The methodology included extensive interactions with representatives from the participating organizations and concluded with an exercise to test the operational procedures. The operational procedures were grouped into four phases. This chapter described each phase and each operational procedure. We also described the different components of each operational procedure and their benefits. The design process is generic enough to be applicable for any kind of situations requiring a set-up for mutual aid between multiple groups or organizations. It can be used as the basis for creating a decision-making system for taking care of specific situations.

# Chapter 5: Discussion

## *5.1 Evaluation of the approach and the results*

We discussed how we went about designing and documenting the decision-making system for mutual aid systems. We now need to evaluate our approach vis-à-vis established approaches and methodologies for designing such systems.

Smart and Vertinsky (1977) suggest some preventive measures to take while designing for crisis decision units. To address the lack of decision readiness that might exist in organizations, they suggest the creation of scenarios. We performed scenario generation to come up with the different procedures.

We were also able to identify special communication channels to be used during the non-routine processes as suggested by Smart and Vertinsky. We identified the use of the Hospital Resource Network (HRN) and an emergency dial-in line.

Huber and McDaniel (1986) suggest creating of a degree of specialization among decision-making units to be able to carry out the anticipated variety of decisions. Organizational members and groups of members make decisions on behalf of their organizations. When acting in this capacity, they are called decision units. For our project, this part had already been handled by the MOCEP organizations. We received a good mix of people representing every organization having authority to make decisions about the procedures.

Huber and McDaniel also suggest that, if both routine and non-routine decisions need to be addressed, a dual structure should be created, one with rigid processes for routine decisions and one with flexible processes for non-routine decisions. We have been able to achieve this dual structure and define a structure for non-routine decision-making processes. And, given the nature of the system, it has to be flexible inherently.

The operational procedures we defined for the project describe in sufficient detail how every process is carried out. The decision-making process diagrams and job action sheets have been incorporated into the HICS for each MOCEP organization.

We generated standard formats for information gathering and sharing as a part of the operational procedures package. These formats are associated with different operational procedures that need quick processing and assimilation of information. Smart and Vertinsky mention that such an approach helps in preventing information overload which may arise from increased information inputs.

We used the decision-making process diagrams as an aid for visualizing the information presented in the operational procedures. These have been very useful in conveying the processes followed in each operational procedure. Good representations can shift the cognitive load by balancing the use of mental resources, shifting attention, and creating perceptual cues (Nicolas et al., 2002). Likewise, poor representations create additional tasks or make the tasks more difficult to perform. Casner and Larkin (1989) have suggested that good representations reduce the amount of cognitive processing in two ways: (1) they allow users to substitute less

demanding visual operators for more complex logical operators, and (2) they reduce the search time for the information required to perform a task. We feel that the decision-making process diagrams have successfully met their purpose as easy perceptual cues and made the task of understanding and updating the operational procedures significantly easier for the designers as well as the users.

The improvement workshop that was conducted served as a very useful platform to review the operational procedures by bringing together the design team and the MOCEP representatives. It provided much needed verification of the procedures with everyone present in the same room. The fact that the representatives present for the workshop were experts in their field of work was a huge benefit. The use of decision-making process diagrams to go through all the procedures made the whole process easier because we did not have to go through all the descriptive text in the operational procedures. We made updates to the diagrams during the workshop and later incorporated the changes into the procedures. We feel that it would have been more effective if there were time to go over all the updated procedures before the tabletop exercise.

Tabletop exercises have been used very successfully in testing the emergency preparedness of various organizations. This tabletop exercise also served its purpose and was a successful validation platform for the operational procedures. We did get insight into missed details during the use of the operational procedures during the tabletop exercise. But, it being a simulated exercise it had its limitations. It was dictated by a very strict time scheduled that was not realistic. Having said that, all the

participants responded very well to the imposed scenario and used their experience as well as the operational procedures to respond to the simulated disaster event.

### *5.2 What could be improved?*

Although some aspects of the approach worked really well, there are some things that we feel could be improved.

Due to the time constraint and the setup of the design process, we were unable to meet with and discuss with all the people who had roles in the decision-making process and get their input. We had to depend upon the input provided by the MOCEP representatives, and we feel that it might have been beneficial if we had been able to meet the people involved in the process and received their input directly about their roles and responsibilities.

Again, due to how the project was setup, we were unable to ensure or participate in any of the training that was provided to the hospital decision-makers about the operational procedures. If we could have participated in the training process, it might have proved helpful in improving the processes. The additional interaction with the actual people filling the roles defined by the decision-making system might have given a valuable input about their roles. As far as the tabletop was concerned, we feel that the MOCEP representatives did a great job in training the people of their organizations in preparation for the exercise.

Currently, there is no set plan for periodic updates of the procedures. It would be a good idea to set up a duration after which the procedures need to be updated. It would

also be a useful exercise to review the situations that might require the organizations to update the procedures.

We did not generate any formal requirements for the decision-making system. We know that it is a good engineering practice to formalize a set of requirements for any system that is designed. However, this was not required of us as a part of the project. Still, it would have been an important step to formally specify the requirements of the decision-making system. It could identify easily the premises under which the decision-making system was designed. For example, after going through the operational procedures, one realizes that the Command Hospital has a major role in the successful implementation of the Emergency Mutual Aid System. Had we made a requirement out of it, it would have said, "There should exist a methodology to identify the Command Organization in case of disaster situations" and so on. In addition, a formal specification of requirements allows the better understanding of constraints of a system. Requirements would also clearly show what the system can do and cannot do. For example, we could have said, "The decision-making system is not a solution or a tool that guarantees an organization's ability to handle a crisis. It only serves as an aid to help support the decision-making process in case of disasters requiring mutual aid." In addition, we could define triggers that require an update to the operational procedures and decision-making processes. It would be quite challenging to come up with the requirements of this particular system because most of the requirements would be qualitative in nature. But, nonetheless, it might be an important step in formalizing the decision-making system.

Though the decision-making process diagrams we generated were much appreciated and easy to understand, there is a potential chance of confusion based on the use of arrows that link one activity to the other. In some places the arrows are used to denote information passing while in others they are used to show the sequence of occurrence of the activities. For example, consider the current and proposed decision-making process diagrams for the operational procedure OP-2A shown in Figure 8 and Figure 9 respectively. In Figure 9, we have successfully separated the temporal information and information passing between activities. But again, the customer has to decide the level of detail that is required. One other thing that could potentially be improved is the depiction of options in the diagrams. For example, the diagram could show what needs to be done if the HRN is not working.

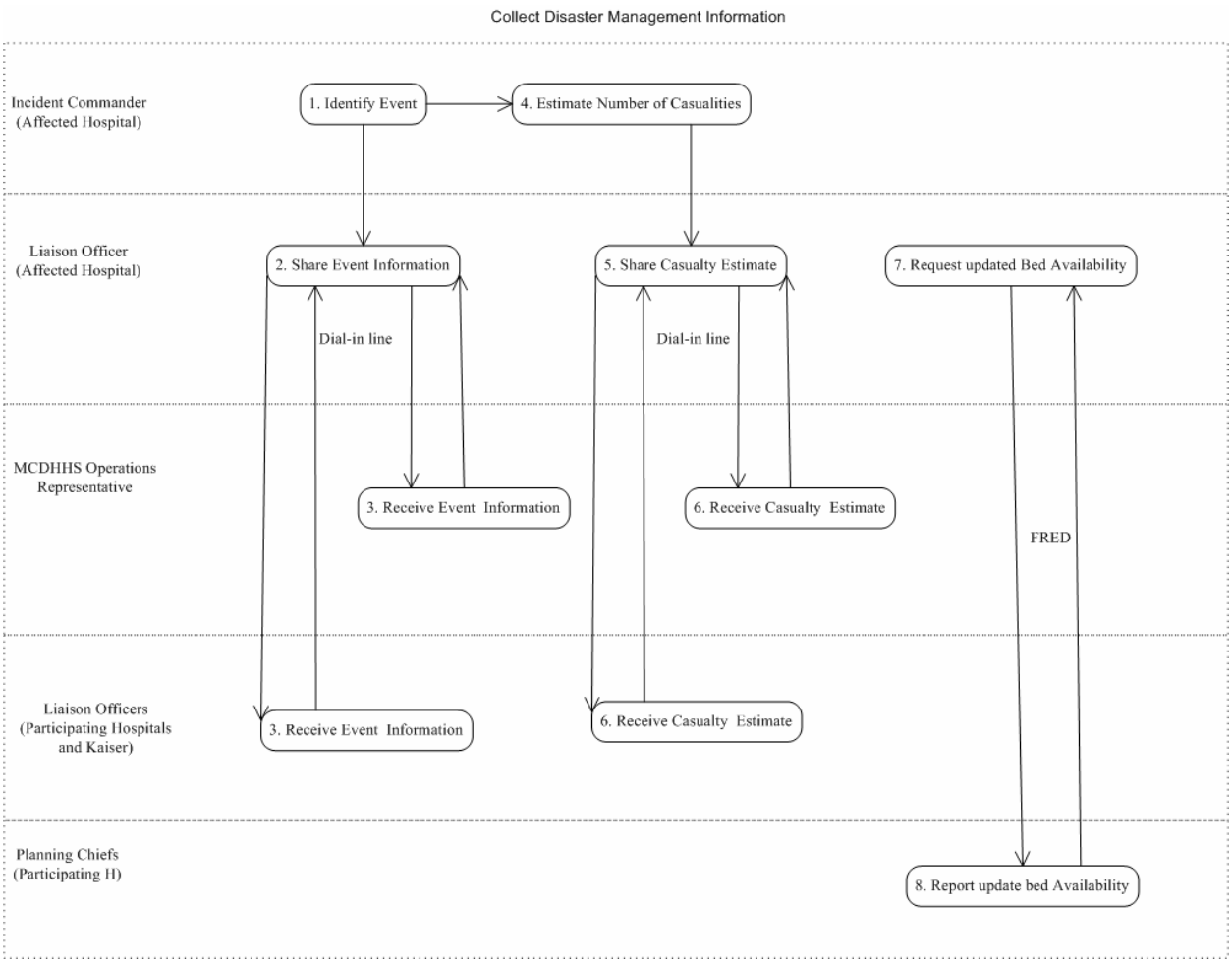



**Figure 8**: **Current Decision-Making Process Diagram for OP-2A: Collect Information**

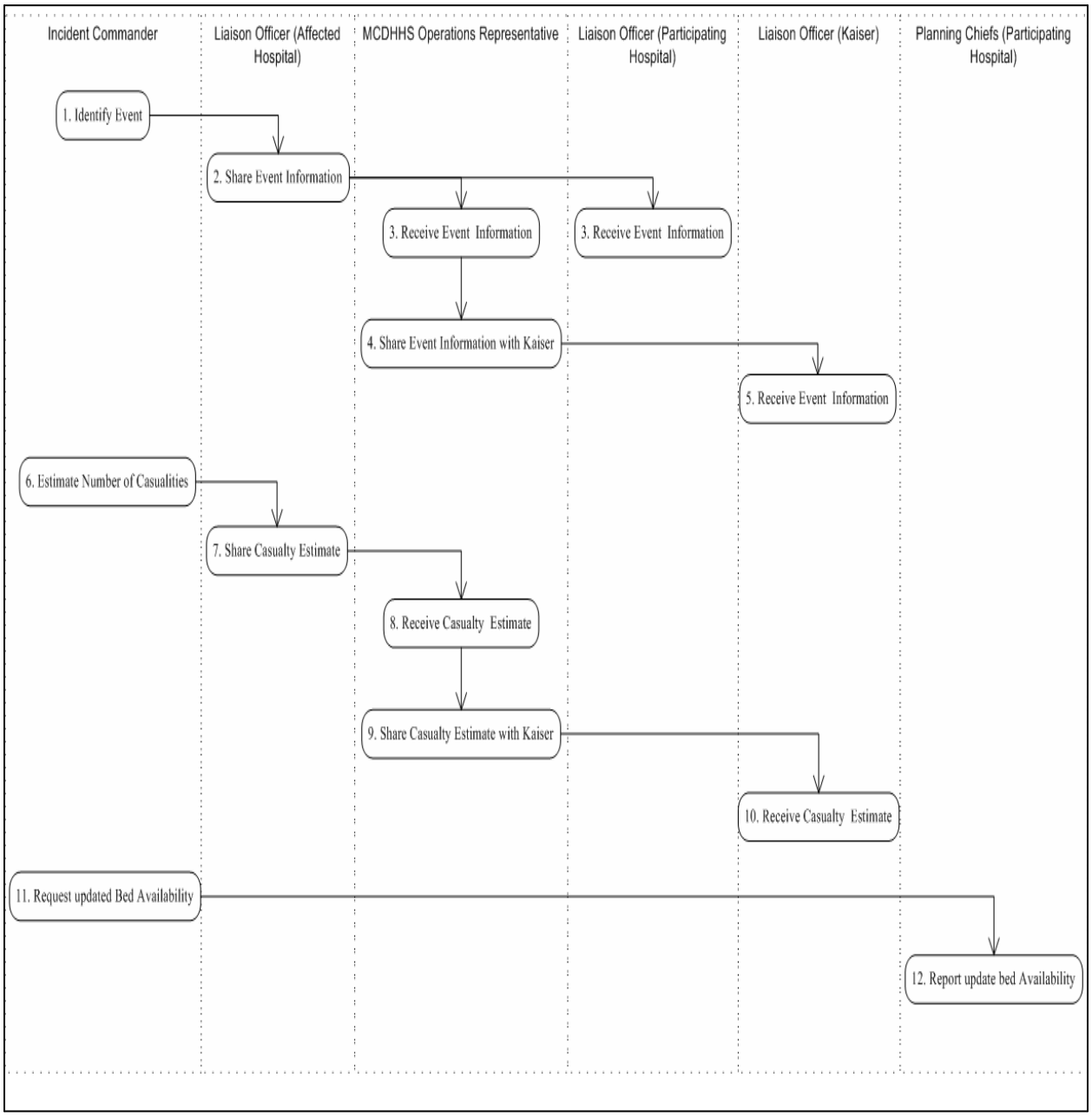



**Figure 9**: **Proposed Decision-Making Process Diagram for OP-2A: Collect Information**

## *5.3 Conclusions*

In this chapter, we evaluated our approach for designing the decision-making system. We compared the design methodology with available methodologies and suggested improvements that need to be made. The scope of the project played a major role in how the process was carried out, and, given those constraints, we were able to design the operational procedures in a way that were easily understandable and could be easily incorporated into the MOCEP organizations' existing Hospital Incident Command System (HICS). We were successfully able to validate the usefulness of the procedures using the tabletop exercise.

# Chapter 6: Summary

We are proposing the use of our decision-making system of mutual aid between two or more organizations as a resource for handling a crisis. For example, in the aftermath of hurricane Katrina crisis, many children had to be transferred to schools in other areas. We consider this as a situation needing mutual aid. Transfer of students from one school to another is a routine task, but the transfer of so many students at the same time is clearly a non-routine task. We believe that our system will be able to help decision-making in such instances.

## *6.1 Revised process for designing a crisis decision-making system*

Now that we have designed and developed a decision-making system for mutual aid among the MOCEP organizations during disasters, we feel that the design process can be generalized and extended to other organizations facing disasters too. We propose the following approach to design such a system.

1. Check organization readiness: Ensure that the organization has resources to support the design of the decision-making system.
    a. Ensure that there is enough management support for undertaking this activity.
    b. Ensure that there is funding for undertaking the activity.
2. Select people for the decision-making unit: As suggested by Huber and McDaniel (1986), the decision-making units should have a degree of specialization so that they can handle the complexity of the decision situations encountered. We also

believe that these members should also have the authority to make decisions or define the processes for their organization.

3. Get the organization(s) ready: Have talks with the organizations involved in the mutual aid process. Identify the situations that may need mutual aid.
4. Get support from government agencies if required: Contact the government agencies and involve them in your process if required.
5. Set up communication channels: Set up communication channels like emergency dial-in lines and contact numbers to share and track important information.
6. Generate scenarios and create contingency plans: Generate scenarios which may take place in disaster situations and need to be handled. Also create contingency plans for the processes so that if one channel does not work out, there are other modes to exchange information.
7. Create operational procedures: Create operational procedures just for handling the crisis decision-making process. These should be separate from and in addition to the procedures the organizations already have in place for routine decision-making.
8. Create decision-making process diagrams: Make visual diagrams for the operational procedures as an easy reference tool for the organizations.
9. Create communication formats: Create formats and databases for sharing information among organizations.
10. Set up channels for feedback: Set up anonymous channels for expressing opinions and providing information to the group (Delphi technique) during the design process (Smart and Vertinsky, 1977).

11. Improve and update the operational procedures: Based on feedback from the representatives of the organizations, improve and update the procedures. Carry out an improvement workshop with all the representatives present in the same room. Collect and implement the feedback from the workshop.
12. Train the organization: Train the members of the organizations who are expected to play important roles in the mutual aid process. Generate accountability through the process of training – people should know and understand that they will be accountable for oversight and planning.
13. Train the community: Provide education about the existing mutual aid systems to the community so that they are aware of the emergency preparedness exercises going on in the community. If necessary, engage the community in the training.
14. Enact scenarios: Carry out a tabletop exercise to simulate a mutual aid problem. This will help promote awareness and evaluate the readiness of the organizations. Update the processes based on the information received from the tabletop exercise.
15. Update the operational procedures periodically: The operational procedures must be revisited and evaluated for any changes in organization's policy, structure or change in technology involved for handling crises. Based on the evaluations, the procedures should be updated.

## *6.2 Future work*

Based on the project for MOCEP, we have designed a decision-making system to be used by organizations to provide mutual aid to each other during a crisis. We believe that further work can be done to improve upon this design.

One such aspect that should be considered is the actual validation of the design methodology we used. Frey and Dym (2006) suggest an interesting analogy with medicine to come up with a method for validating a design method. They introduce the analogy between medical treatment and design method by comparing the primary goals. The primary goal of medical research is to develop treatments for human patients, and the purpose of the treatment is to achieve clinical outcomes related to improved health. The primary goal of design research is to develop design methods to be learned and used by designers to create engineering artifacts and the purpose it to achieve specific design outcomes. The 1962 amendment of the Food, Drug and Cosmetics (FDC) Act requires provision of "evidence consisting of adequate and well controlled investigations … that the drug will have the effect it purports or is represented to have under the conditions of use prescribed, recommended, or suggested in the labeling or proposed labeling thereof" (U.S. Federal Food, Drug, and Cosmetic Act, Chapter 9.V, Sec. 355(d)). Similarly, (though it lacks the force of law) the IEEE definition of validation entails "confirmation by examination and provision of objective evidence that the particular requirements for intended use are fulfilled" (Institute of Electrical and Electronics Engineers 1998). We know that validation requires that evidence be provided and the types of evidence provided in medical

research and development are rich and varied. Frey and Dym (2006) suggest the analogy of clinical trials to controlled field evaluation methods. For validation of a design methodology, a "clinical trial" could help identify design problems and allocate specific design method to be studied and a comparable tool. A clinical trial could be an experiment in which different methods are allocated to organizations or tasks within the method. The resulting effects on quality or performance might be monitored statistically.

We used the improvement workshop and the tabletop exercise to validate our methodology. Still, some more work needs to be done to find out whether the design method can be monitored statistically and whether we could find more methods or better methods to validate the design methodology.

In addition, even though we propose a design method that can be applied to different kinds of mutual aid problems, it still needs to be validated whether we can apply the same methods or we need to do something different.

It would also be useful to look into whether there are other visual modeling techniques that could be used and compare them to our decision-making process diagrams.

Currently, the processes are designed to be carried out with data from various sources and relying on information passed through the communication networks. Creating a common database could keep track of various kinds of information that needs to be

handled might be a good idea. However, whether such a decision-support system would really prove helpful needs to be researched.

We hope that others will take this contribution, apply it in their setting, and share their results so that we can continue to improve the methodology and increase our ability to design effective decision-making systems.

# Appendix A – Sample Operational Procedure

***Title***

Operational Procedure OP-3A: Request Pharmaceuticals, Supplies, or Equipment (PSE)

***Overview***

This document describes Operational Procedure OP-3A: Request Pharmaceuticals, Supplies, or Equipment (PSE). It describes the scenario in which this Operational Procedure should be invoked, identifies the goal of the Operational Procedure, lists those who should participate, specifies the decision-making process, provides options, and explains the associated tasks.

***Scenarios***

This Operational Procedure should be invoked when the inventory of some pharmaceuticals, supplies, or equipment (PSE) at a hospital becomes (or will soon become) insufficient for treating patients (both those already admitted and those expected to arrive) during a Medical Disaster. PSE items include (but are not limited to) the following:

- respirators
- IV infusion pumps
- dialysis machines
- hazardous material (HAZMAT) decontamination equipment
- ventilators
- external pacemakers
- atropine
- kefzol
- valium and other behavioral health drugs
- albumin

The hospital that requests PSE is called the Recipient Hospital. A hospital that supplies (or may supply) PSE is called a Transferring Hospital. Kaiser may also be the one of the Transferring Healthcare facilities. Early in the scenario, all of the Participating Hospitals in Montgomery County Healthcare Collaborative are Transferring Hospitals, since they all consider the request. Ultimately, a specific Transferring Hospital provides the supplies.

***Goal***

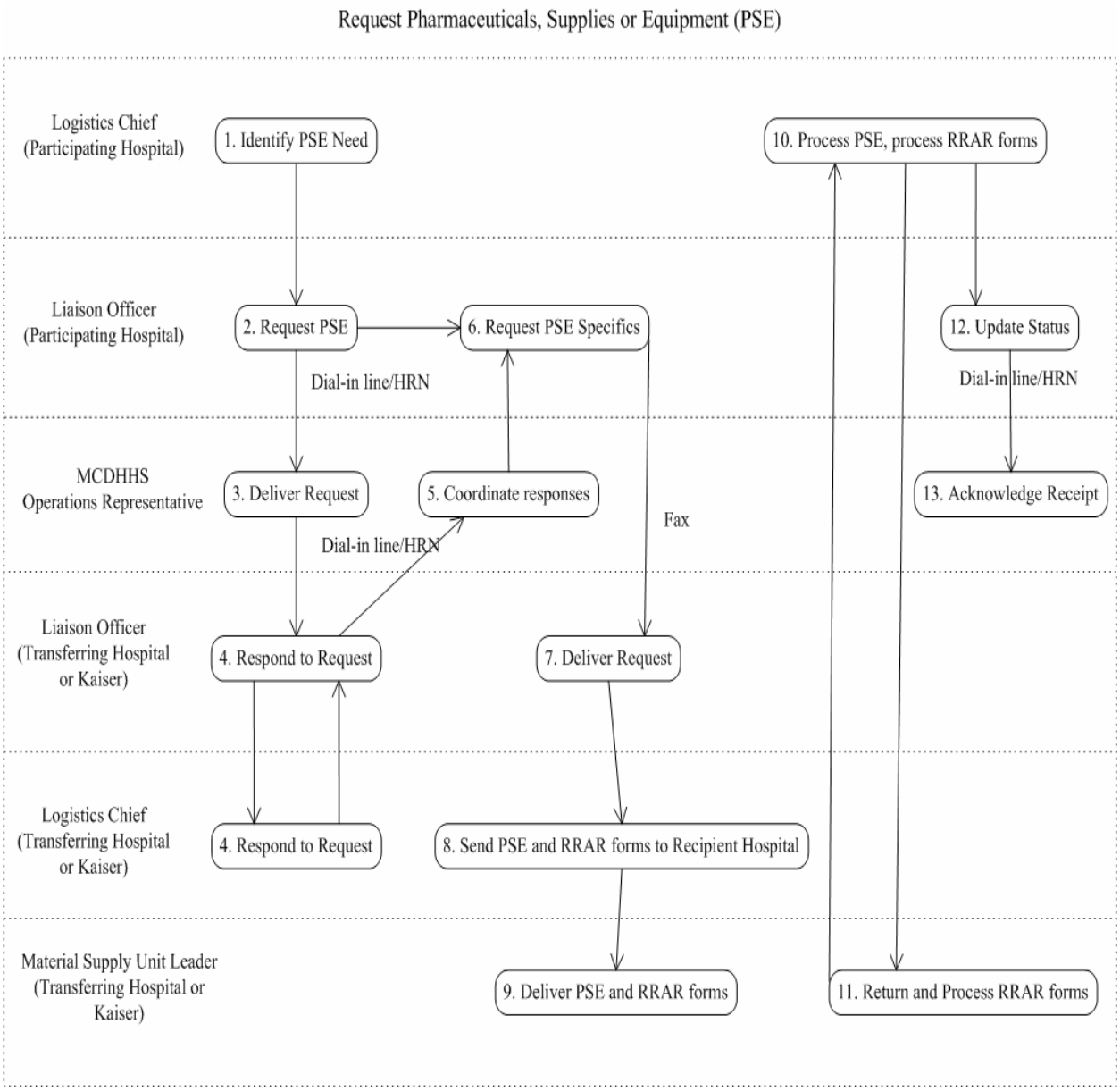
This Operational Procedure is intended to increase the inventory of the requested pharmaceuticals, supplies, or equipment (PSE) at the Recipient Hospital to a level sufficient for treating patients during a Medical Disaster.

The participating hospitals and Kaiser use the Resource Request and Accounting Record (RRAR) form to record the requisition and supply of PSE

***Roles***

- Logistics Chief at Recipient Hospital
- Liaison Officer at Recipient Hospital
- MCDHHS Operations representative in the Montgomery County EOC
- Liaison Officer at Transferring Hospital or Kaiser
- Logistics Chief at Transferring Hospital or Kaiser
- Material Supply Unit Leader from Transferring Hospital or Kaiser

### *Decision-Making Process*



***Task Details***

1. Identify PSE need:

***Communication:*** Internal.
***Content:*** What type of PSE is needed, how much, urgency
***Target:*** Liaison Officer at participating hospital

***Description:*** The Logistics chief at the Recipient Hospital identifies the need for PSE and sends a request to the Liaison officer at the participating hospital

2. **Request PSE:**

***Communications system:*** Dial-in line / HRN.
***Content:*** What type of PSE is needed, how much, urgency
***Target:*** MCDHHS Operations representative in the Montgomery County EOC

***Description:*** The Liaison Officer at the Recipient Hospital requests PSE from the other participating hospitals and Kaiser through the MCDHHS operations representative

3. **Deliver request:**

***Communications system:*** Dial-in line/ HRN.
***Content:*** Who needs PSE, what type of PSE is needed, how much, urgency
***Target:*** Liaison Officers at all Participating Hospitals

***Description:*** The MCDHHS operations representative delivers the request to the Liaison officers at the other participating hospitals and Kaiser

4. **Respond to request:**

***Communications system:*** Dial-in line/ HRN.
***Content:*** What type of needed PSE is available, how much is available, time needed to fulfill request
***Target:*** MCDHHS Operations representative in the Montgomery County EOC

***Description:*** The Liaison Officers respond to the request for PSE with the help of their Logistic Chiefs

5. **Coordinate Responses:**

***Communications system:*** faxes to Transferring Hospitals (see contact sheet).
***Content:*** Montgomery County Healthcare Collaborative PSE Request Form, DEA form for Controlled substances (if applicable)
***Target:*** Liaison Officers at Transferring Hospitals or Kaiser

***Description:*** The MCDHHS operations representative passes on the request for PSE with specifics from Liaison Officer to the other participating hospitals and Kaiser

6. **Request PSE specifics:**

***Communications system:*** fax to Liaison Officer at Transferring hospital or Kaiser
***Content:*** Montgomery County Healthcare Collaborative RRAR Form, DEA form for Controlled substances (if applicable)

***Target:*** MCDHHS Operations representative in the Montgomery County EOC, Logistics Chief at Recipient Hospital.

***Description:*** The Liaison Officer at the Recipient Hospital requests the PSE from the other participating hospitals and Kaiser and provides specific details using RRAR forms

7. **Deliver Request:**

***Communication:*** Internal
***Target:*** Logistics Chief at Transferring Hospital or Kaiser
***Content:*** Details of the request

***Description:*** The Liaison officers of the Participating Hospital or notify Logistics Chief at Transferring Hospital or Kaiser via standard operating procedures

8. **Send PSE and RRAR forms to Recipient Hospital**

***Communication:*** Internal
***Target:*** Material Supply Unit leader at Transferring Hospital.
***Content:*** Requested items and Transferring Hospitals' standard order requisition forms

***Description:*** The Logistics Chief at the transferring hospital sends the RRAR forms to their Material Supply Unit Leader

9. **Deliver PSE and requisition order forms to Recipient Hospital**

***Communication:*** The Transferring Hospital arranges for the transportation of supplies
***Target:*** Logistics Chief at the participating hospital
***Content:*** PSE and requisition order forms

***Description***: The Material Supply Unit leader arranges for transferring the PSE to the participating hospital.

10. **Process PSE and process RRAR forms:**

***Communication:*** Internal
***Target:*** Liaison Officer (Recipient Hospital)

***Description:*** The Logistics Chief at the Recipient Hospital signs and returns the RRAR forms. Informs Liaison Officer at Recipient Hospital. Process and distribute received items using Recipient Hospital's standard operating procedures.

11. **Return and process RRAR forms:**

***Description:*** Use Transferring Hospital's standard operating procedures.

12. **Update status**:

***Communications system:*** Dial-in line/ HRN.
***Content:*** What type and quantity of PSE was received and from whom.
***Target:*** MCDHHS Operations representative in the Montgomery County EOC

***Description:*** The Liaison officer at the Recipient Hospital updates the MCDHHS Operations representative about the receipt of PSE

13. **Acknowledge receipt:**

***Communications system:*** Hospital Dial-in line/ HRN.
***Content:*** What type and quantity of PSE was received and from whom.
***Target:*** Liaison Officer at Recipient Hospital

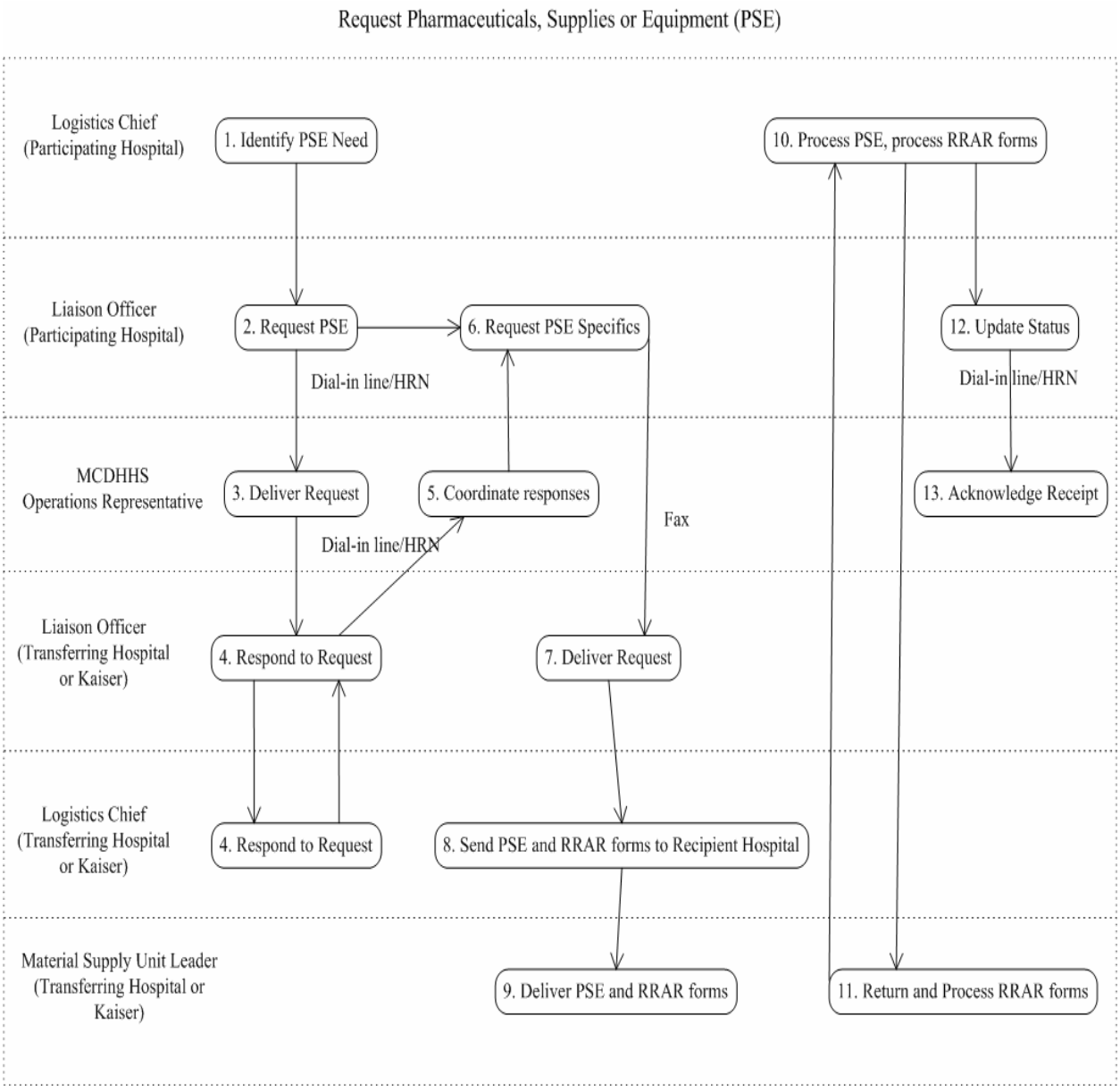
***Description:*** The MCDHHS Operations representative acknowledges the receipt of information from the Liaison officer at the Recipient Hospital

***Options***

- If the MCDHHS Operations representative is not available, then communication between hospitals will be directly between hospital Liaison Officers.
- Transfer of supplies is the responsibility of the supplier. If the supplying hospital does not have enough resources, the supplying hospital contacts the command hospital and the command hospital makes arrangements. If the command hospital is unable to make arrangements, contact MCDHHS

***Job Action Sheet: Logistics Chief (Recipient Hospital)***

**Mission:** Obtain needed PSE.



**TASKS:**

**Identify PSE need:**

Identifies the need for PSE and sends a request to the Liaison officer at the participating hospital

(This is Task 1 in the decision-making process.)

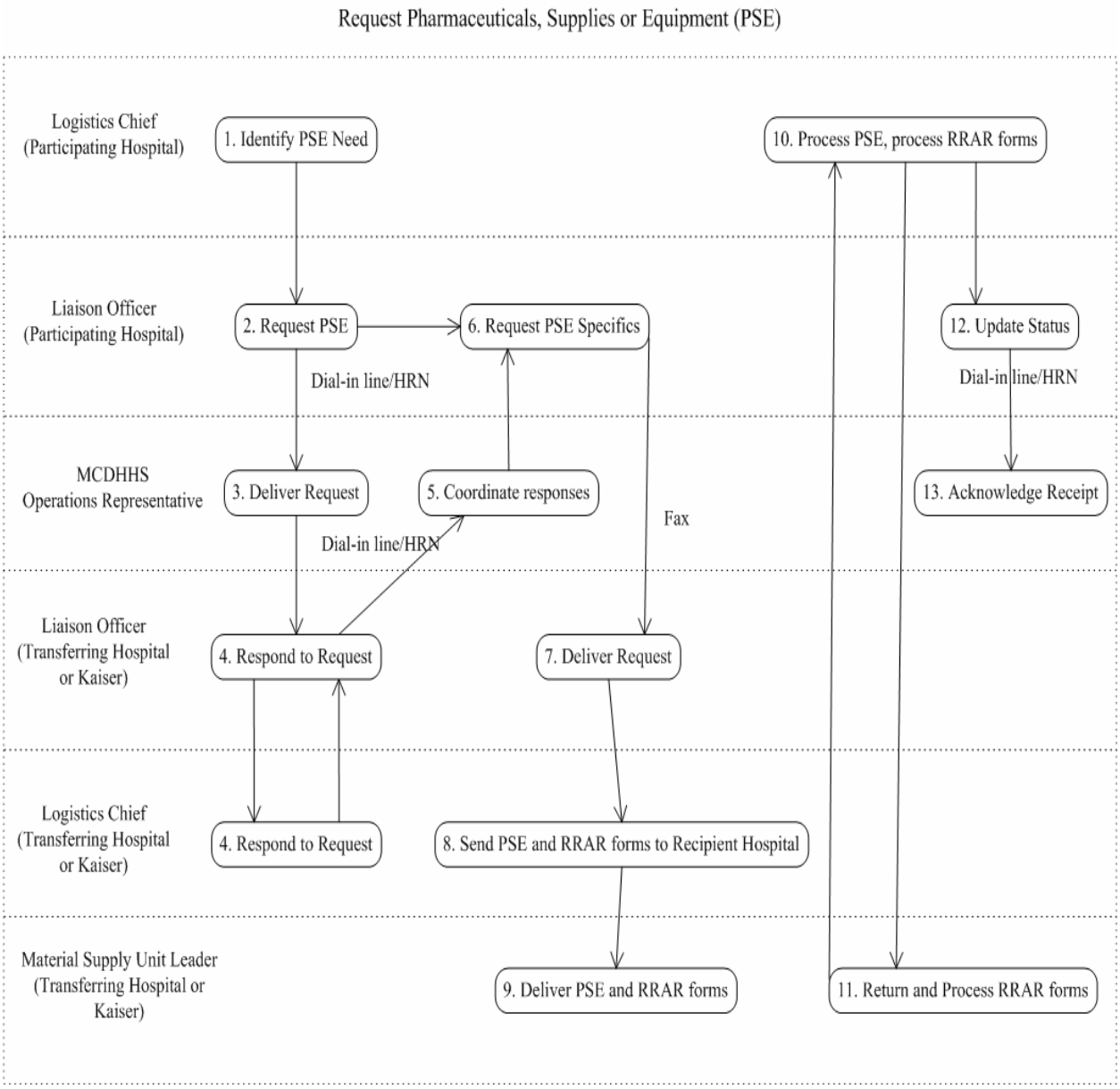
**Process PSE and complete receipts:**

Signs and return receipts. Informs Liaison Officer at Recipient Hospital: what type and quantity of PSE was received and from whom. Process and distribute received items using Recipient Hospital's standard operating procedures.

(This is Task 10 in the decision-making process.)

***Job Action Sheet: Role: Liaison Officer (Recipient Hospital)***

**Mission:** Communicate needs for PSE to EOC.




**TASKS:**

**Request PSE:**

Requests PSE from the other participating hospitals and Kaiser through the MCDHHS operations representative

(This is Task 2 in the decision-making process.)

**Request PSE specifics:**

Request the PSE and provides specific details using the standard forms from the other participating hospitals and Kaiser through the MCDHHS operations representative

(This is Task 5 in the decision-making process.)

**Update status**:

Update the MCDHHS Operations representative about the receipt of PSE

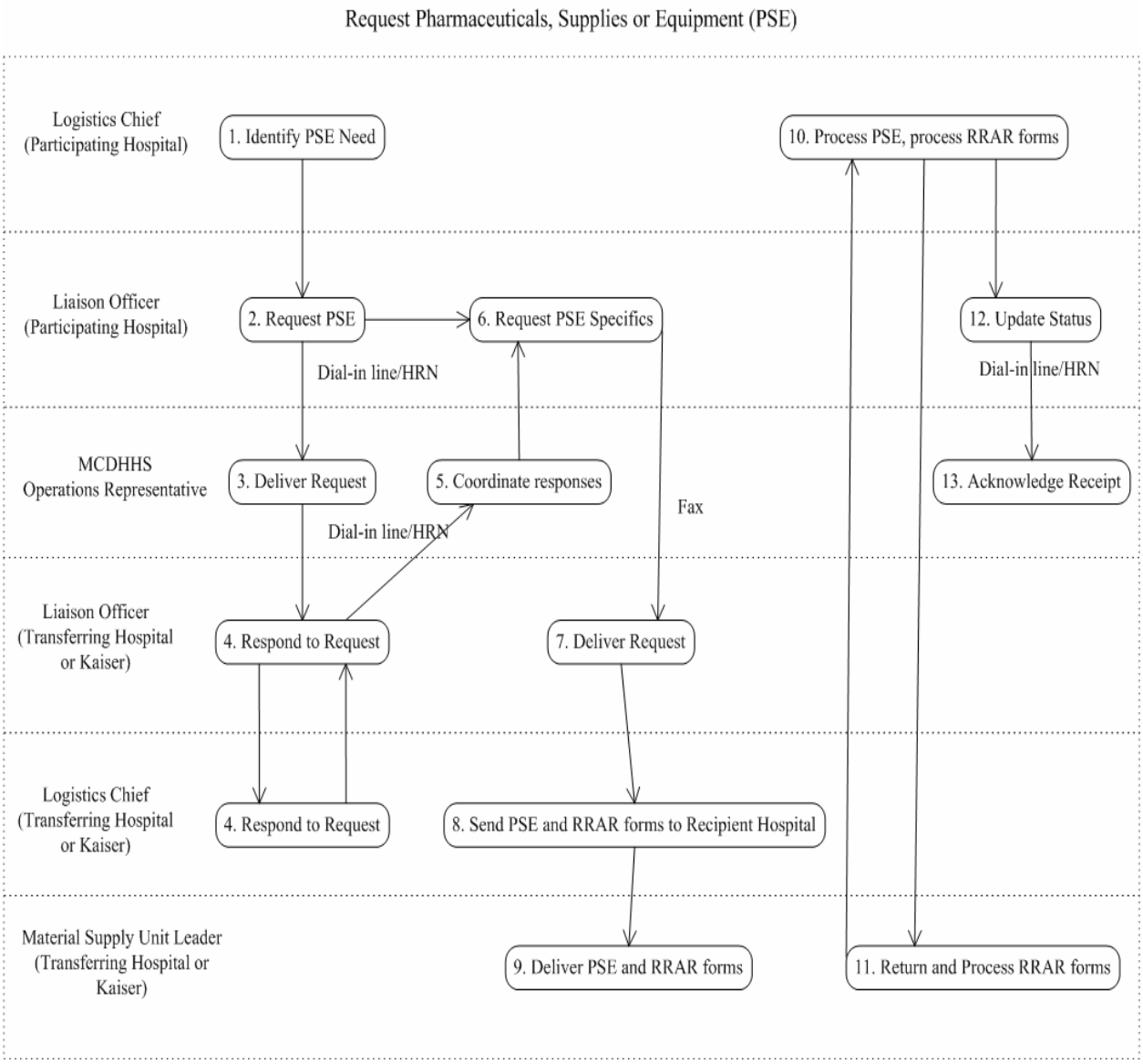
(This is Task 12 in the decision-making process.)

***Options***

- If the MCDHHS Operations representative is not available, then communication between hospitals will be directly between hospital Liaison Officers.

***Job Action Sheet: MCDHHS Operations representative in the Montgomery County EOC***

**Mission:** Match request for needed PSE to PSE available at Transferring Hospitals.




**TASKS:**

**Deliver request:**

***Description:*** Deliver the request to the Liaison officers at the other participating hospitals and Kaiser

(This is Task 3 in the decision-making process.)

**Coordinate Responses:**

Pass on the request for PSE with specifics from Liaison Officer to the other participating hospitals and Kaiser

(This is Task 6 in the decision-making process.)

**Acknowledge receipt:**

Acknowledge the receipt of information from the Liaison officer at the Recipient Hospital

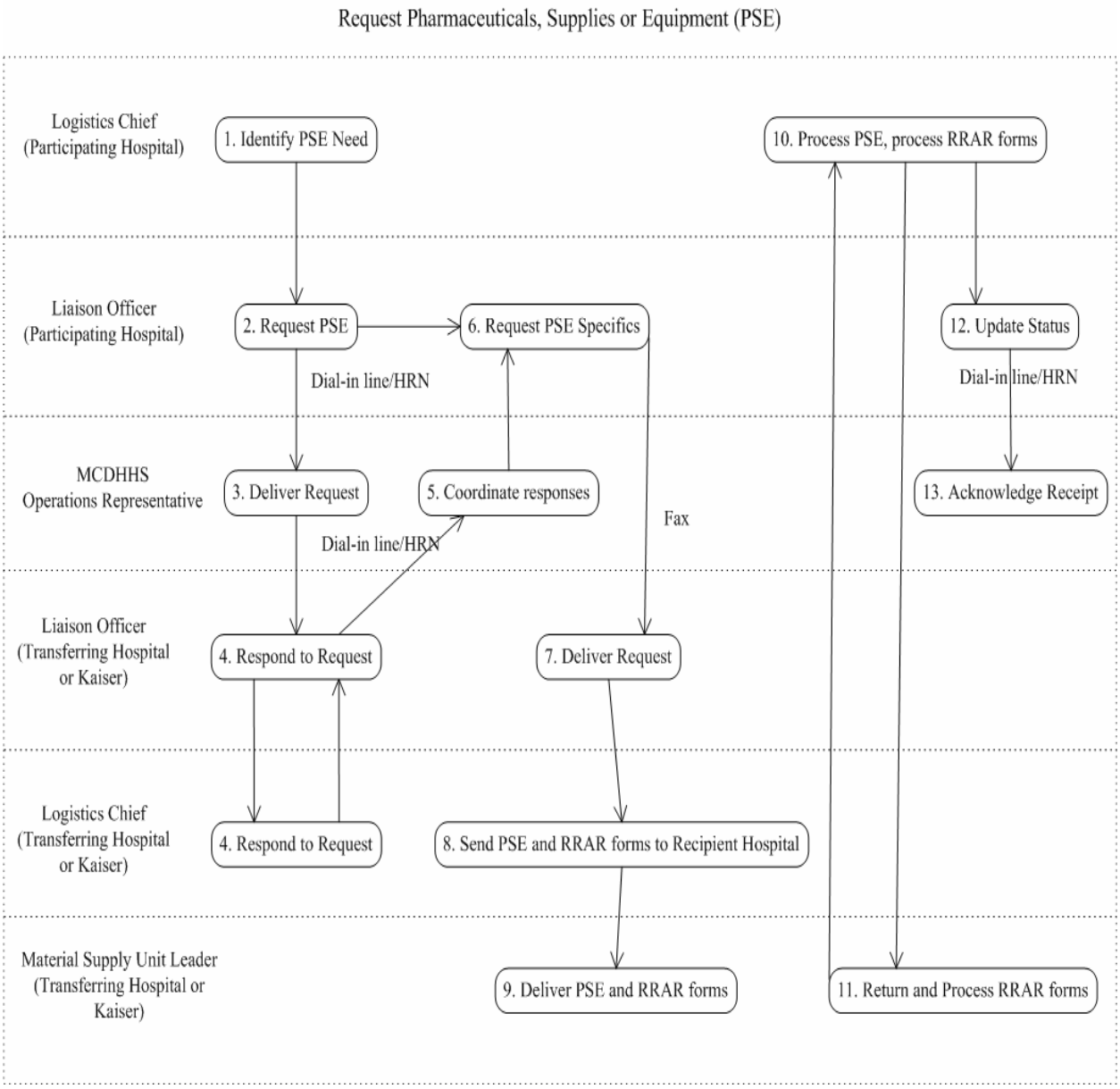
(This is Task 13 in the decision-making process.)

***Options***

- If the MCDHHS Operations representative is not available, then communication between hospitals will be directly between hospital Liaison Officers.

***Job Action Sheet: Liaison Officer (Transferring Hospital or Kaiser)***

**Mission:** Provide needed PSE to Recipient Hospital.




**TASKS:**

**Respond to request:**

Respond to the request for PSE with the help of their Logistic Chiefs

(This is Task 4 in the decision-making process.)

**Deliver Request:**

Notify Logistics Chief at Transferring Hospital or Kaiser via standard operating procedures.

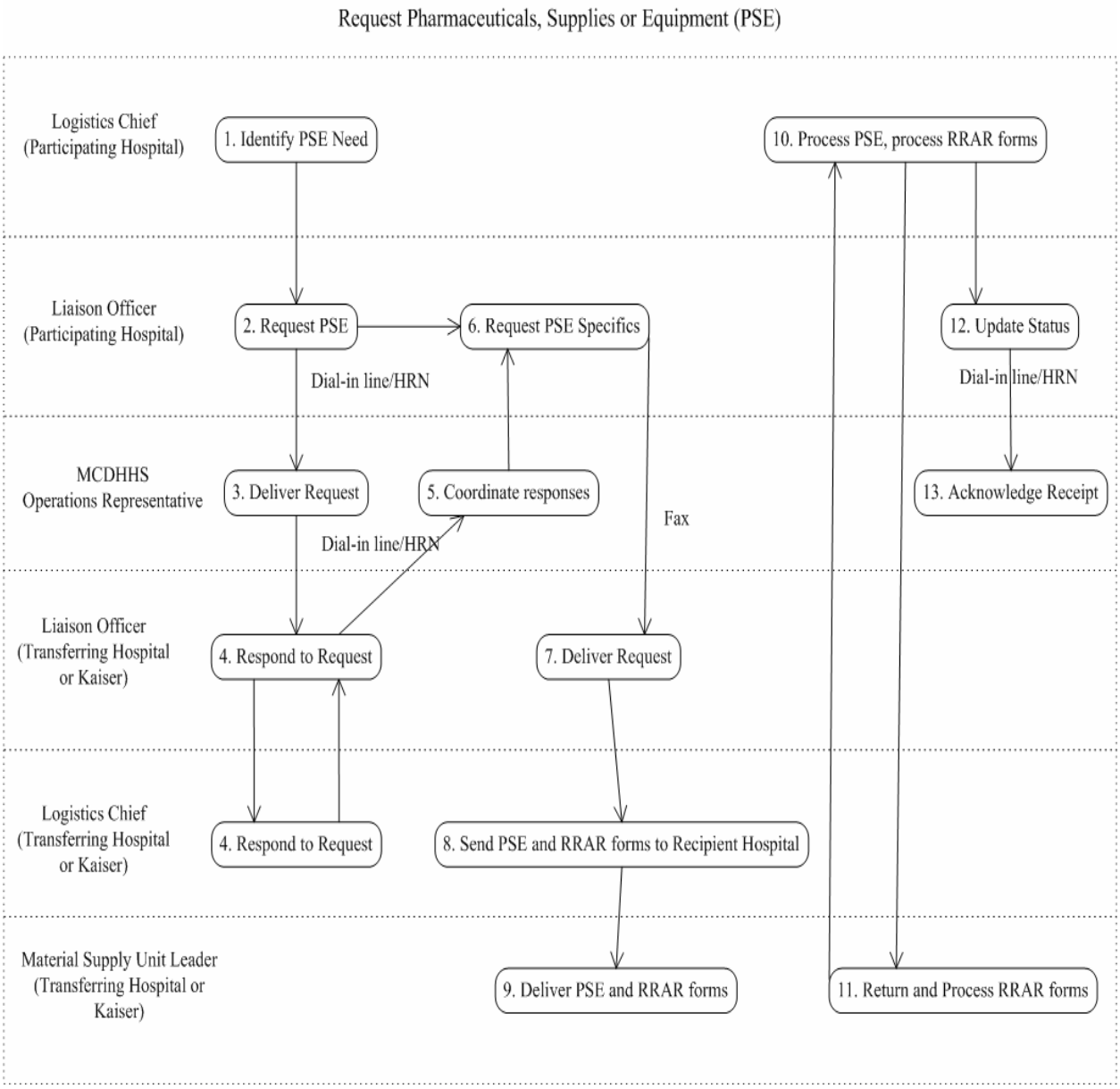
(This is Task 7 in the decision-making process.)

***Options***

- If the MCDHHS Operations representative is not available, then communication between hospitals will be directly between hospital Liaison Officers.

***Job Action Sheet: Logistics Chief (Transferring Hospital or Kaiser)***

**Mission:** Provide needed PSE to Recipient Hospital.




**TASKS:**

**Respond to request:**

Respond to the request for PSE with the help of their Logistic Chiefs

(This is Task 4 in the decision-making process.)

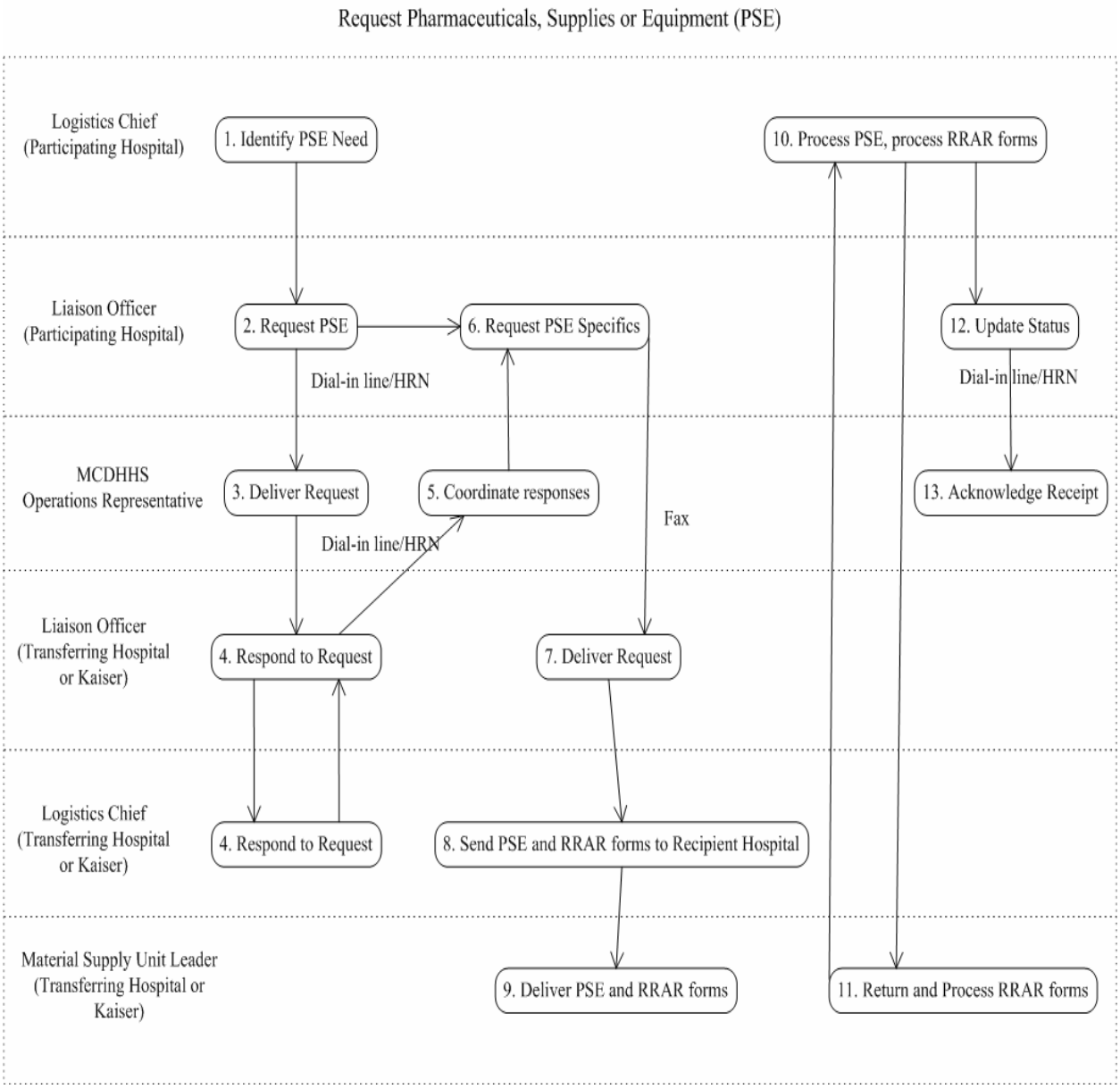
**Send PSE and requisition order forms to Recipient Hospital**

Sends the order forms to the Material Supply Unit Leader

(This is Task 8 in the decision-making process.)

***Job Action Sheet: Material Supply Unit Leader (Transferring Hospital or Kaiser)***

**Mission:** Deliver needed PSE to Recipient Hospital.




**TASKS:**

**Deliver PSE and requisition order forms to Recipient Hospital**

Arrange for transferring the PSE to the participating hospital.

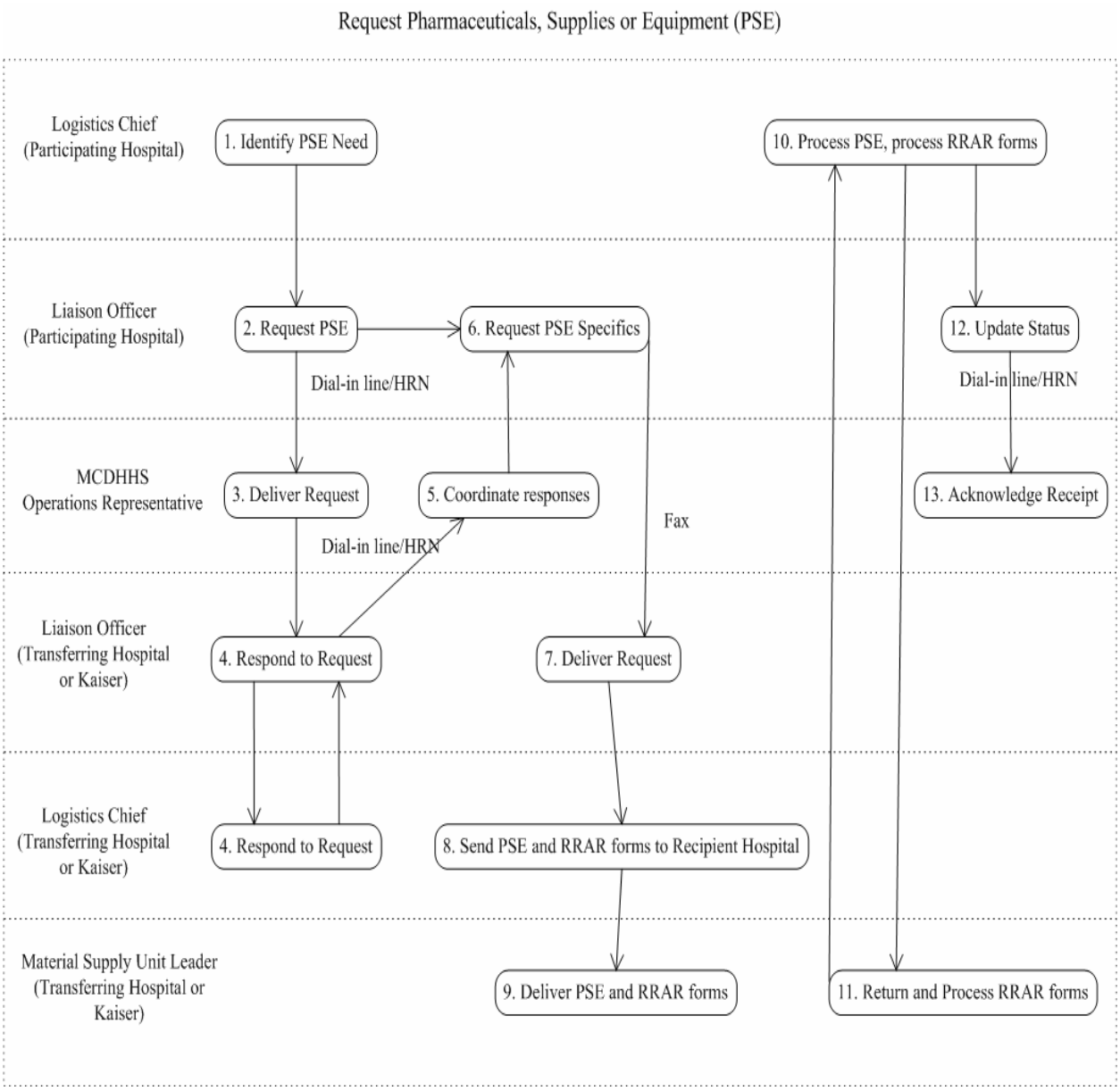
(This is Task 9 in the decision-making process.)

**Return and process receipts:**

Return and process receipts using standard operating procedures.

(This is Task 11 in the decision-making process.)

***Reference Sheet***
***Decision-Making Process***



## Roles

**Logistics Chief at Recipient Hospital:** The Logistics Chief at Recipient identifies the need for PSE and processes the PSE received and the Resource Request and Accounting Record (RRAR) forms.

**Liaison Officer at Recipient Hospital**: The Liaison Officer submits the request for PSE as well as the PSE Specifics and updates the status of the receipt.

**MCDHHS Operations representative** The MCDHHS Operations representative delivers the request to the Liaison Officers and coordinates their responses.

**Liaison Officer at Transferring Hospital or Kaiser:** The Liaison Officer delivers the request to their Logistics Chief and responds to the request.

**Logistics Chief at Transferring Hospital or Kaiser:** The Logistics Chief responds to the request for PSE and sends PSE and RRAR forms to the Recipient Hospital

**Material Supply Unit Leader from Transferring Hospital or Kaiser:** The Material Supply Unit Leader arranges for delivering the requested PSE and requisition order forms.

# Appendix B – RRAR Form

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**Montgomery County Emergency Mutual Aid System**
**Resource Request and Accounting Record**

**Requesting Hospital** (Circle one) Holy Cross | Kaiser | Montgomery General | Shady Grove Adventist | Suburban | Washington Adventist

**Supplying Hospital** (Circle one) Holy Cross | Kaiser | Montgomery General | Shady Grove Adventist | Suburban | Washington Adventist

| A. Item / Product Description | B. Quantity Needed (bulk items only) | C. Serial # / Supply # | D. Quantity Supplied | E. Dispensed To Unit | F. Signature |
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| | Name | Signature | Date and Time |
|---|---|---|---|
| Requested by | | | |
| Supplied by | | | |
| Received by | | | |

**Instructions:**

| Requesting Hospital | Supplying Hospital |
|---|---|
| 1. Circle hospitals' names at top.<br>2. Indicated requested items in Column A. Use separate line for each item except for bulk items. For bulk items, indicate amount requested in Column B.<br>3. Sign on the "Requested by" line.<br>4. Fax to Supplying Hospital. | 5. Provide serial or supply numbers for each item supplied in Column C. For bulk items, indicate amount supplied in Column D.<br>6. Sign on the "Supplied by" line.<br>7. Send this form along with supplied material to Requesting Hospital. |
| 8. Verify that form correctly describes supplied material.<br>9. Sign on the "Received by" line.<br>10. When issuing material to units, indicate unit in Column E and have representative sign for each item issued in Column F. | |

# Appendix C – Acronyms and Abbreviations

| | |
|---|---|
| AHTS | Auxiliary Healthcare Treatment Site |
| AOC | Administrator on Call |
| DHHS | Department of Health and Human Services |
| EMAS | Emergency Mutual Aid System |
| EMRC | Emergency Medical Resource Center |
| EOC | Emergency Operations Center |
| ER | Emergency Room |
| FDC | Food, Drug and Cosmetics |
| FRED | Facilities Resources Emergency Database |
| HICS | Hospital Incident Command System |
| HR | Human Resources |
| HRN | Hospital Radio Network (PS2000) |
| IEEE | Institute of Electrical and Electronics Engineers |
| JIC | Joint Information Center |
| MCDHHS | Montgomery County Department of Health and Human Services Hospital Group |
| MCFRS | Montgomery County Fire Rescue Service |
| MIEMSS | Maryland Institute of Emergency Medical Services System |
| MOCEP | Montgomery County Healthcare Collaborative on Emergency Preparedness |
| MOU | Memorandum of Understanding |
| NDMS | National Medical Disaster System |
| OPM | Operational Procedure Model |
| PHS | Public Health Services |
| PIO | Public Information Officer |
| PSE | Pharmaceuticals, Supplies and Equipment |
| RFP | Request for Proposal |
| RRAR | Resource Request and Accounting Record |
| UML | Unified Modeling Language |

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