Stocking facilities with MVA equipment according to caseload

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Ipas Protecting women's health

JSI John Snow, Inc.

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In the United States and some other countries, the Ipas EasyGrip® cannulae are labeled for single use and should be discarded after use. Where local regulations permit, these cannulae can be reused after high-level disinfection or sterilization. However, the flexible Karman cannulae and the Ipas 3mm cannulae for endometrial biopsy are labeled for single use in all countries and should be discarded after use.

Ipas is a nonprofit organization that works globally to increase women's ability to exercise their sexual and reproductive rights and to reduce abortion-related deaths and injuries. We seek to expand the availability, quality and sustainability of abortion and related reproductive health services, as well as to improve the enabling environment. Ipas believes that no woman should have to risk her life or health because she lacks safe reproductive health choices.

Ipas manufactures the Ipas MVA Plus® and Ipas Single-Valve aspirators, as well as the Ipas EasyGrip® cannulae, the flexible Karman cannulae and the Ipas 3mm cannulae. Any revenues generated from the sale of these instruments after expenses are used to support programmatic efforts to improve women's access to safe reproductive health-care services. We have endeavored to make this manual useful to those developing a sustainable supply of any MVA instruments.

John Snow, Inc. (JSI) is a public health management organization dedicated to improving the health of individuals and communities in the United States and around the world. With more than 30 years of experience, JSI brings practical approaches to address public health problems by building partnerships among governments, non-governmental organizations and communities.

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STOCKING FACILITIES WITH MVA EQUIPMENT ACCORDING TO CASELOAD

Why has this methodology been developed?

Until now, decisionmakers in health facilities performing uterine-evacuation procedures have not had sound guides to estimate their needs for manual vacuum aspiration (MVA) equipment. The methods that were (and sometimes still are) used to estimate quantities often over-rely on estimates of the average number of cases a facility receives per day. These methods are inadequate because the number of cases a facility sees on any given day can deviate substantially from this average.

A new, unique methodology, based upon solid statistical principles and the realities of the field, offers enormous potential for ensuring that facilities have the instruments they need. This monograph first will describe the theoretical bases of the methodology, and then will discuss a simple tool to be used for local decision-making in stocking and resupplying facilities.

Manufactured to high safety and quality standards, Ipas MVA instruments have been used in health-care programs for thousands of women and are distributed through a global network. The Ipas MVA system, consisting of aspirators coupled with cannulae, is the perfect portable uterine evacuation system for the primary point of care. It is ideal for provider offices, clinics, ambulatory and outpatient facilities, emergency rooms and in-patient care.

To perform a procedure with MVA, a properly processed aspirator, together with the necessary cannulae, needs to be ready and available to use for each patient. Input from clinicians, facility managers and other international NGOs that use MVA has revealed that many health-care facilities face chronic equipment shortages.

Therefore, Ipas contracted with the logistics services group of John Snow, Inc. (JSI), an organization with more than 25 years of experience in health logistics, to identify best practices for supplying public-sector facilities with MVA instruments. JSI identified forecasting and stocking as a priority based on a needs assessment of Ipas and other organizations using this lifesaving device.

To some managers, especially those in limited-resource settings, this methodology may appear to recommend an artificially high number of instruments. However, this methodology puts the devices **where they are used,** as opposed to keeping them in warehouses. Furthermore, the methodology increases initial stocking quantities, **but, in the long run, does not increase the number of devices that facilities actually use.**

FINDINGS: HOW WERE FACILITIES ESTIMATING NEED?

Interviews to assess the supply situation found that:

- There was no general, empirical methodology used to decide how to stock facilities.
- In the absence of a clear methodology, individuals developed their own approaches. These approaches often involved stocking clinics with a set number of instruments, i.e. two or three per facility. This set number was often the bare minimum needed for the facility to function and often resulted in shortages.
- There was an understanding that in the clinic, providers needed access to additional devices, other than those actively being used, because instruments can break after accidents or over time.
- The general thinking was, "if you do an average of one procedure per day, then you need one device, plus a spare, in case something happens to make it unusable," or "two devices are needed so that one can be used while the other is being processed."
- There were also complaints that there were not enough devices at a facility, and patients and providers had to wait while MVA products were being processed.

Two major issues have led to MVA shortages:

First: There is no "average day" in a health-care facility. There is a difference between the average number of procedures performed in a facility and the number of procedures performed on any given day. A clinic that on average provides care to one woman each day could have one client on Monday, no clients on Tuesday, Wednesday and Thursday, and four clients on Friday.

Second: The actual practice is not to process instruments immediately, making instruments available after other procedures as soon as processing is complete; rather, it is to collect the used devices in a soak and to clean and process them once per day (or shift), which means that a clinic needs to have all the instruments that will be used during that clinic session on hand.

A STATISTICAL ALGORITHM FOR ACTIVE STOCK – THE POISSON DISTRIBUTION:

We will now present a new, statistically based methodology for stocking facilities.

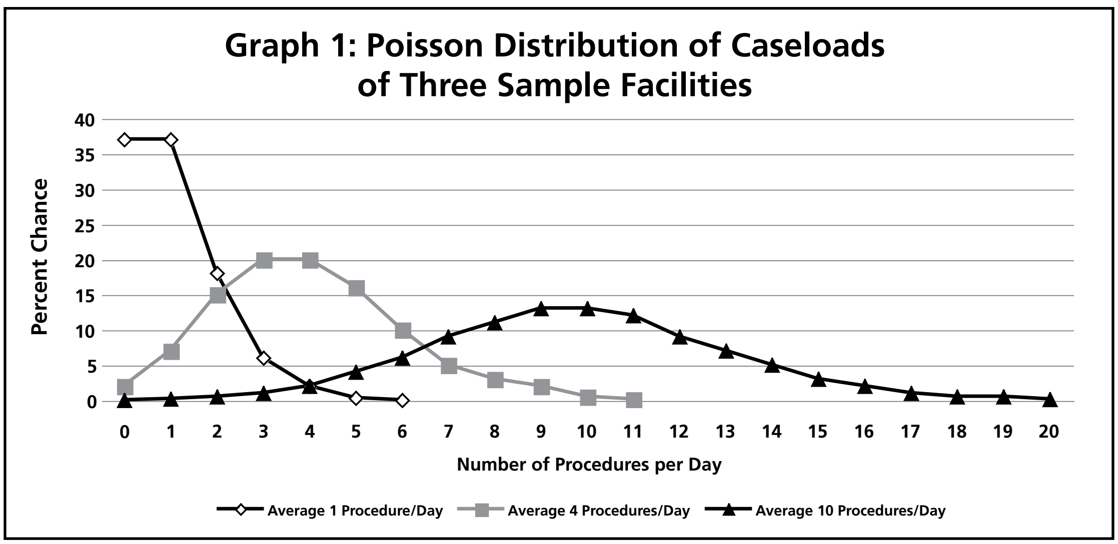
We will discuss two types of stock:

- **Active stock** refers to the devices required in the procedure room to serve clients that may need MVA during a day or shift.
- **Reserve stock** refers to new devices, still in their packaging, that are kept in the facility storeroom. They are used to replace active devices that break.

Siméon Poisson was a French mathematician. In 1838, he developed a mathematical expression to describe the behavior of discrete events (or events countable in whole numbers) that occur in relatively small numbers.

Since then, scientists, engineers and statistical modelers have used the Poisson distribution to analyze transportation modeling, queuing behavior, aerial bombardments and other behaviors. The Poisson distribution has been fully validated and confirmed for more than 150 years.

Below is a graph of the Poisson distribution:

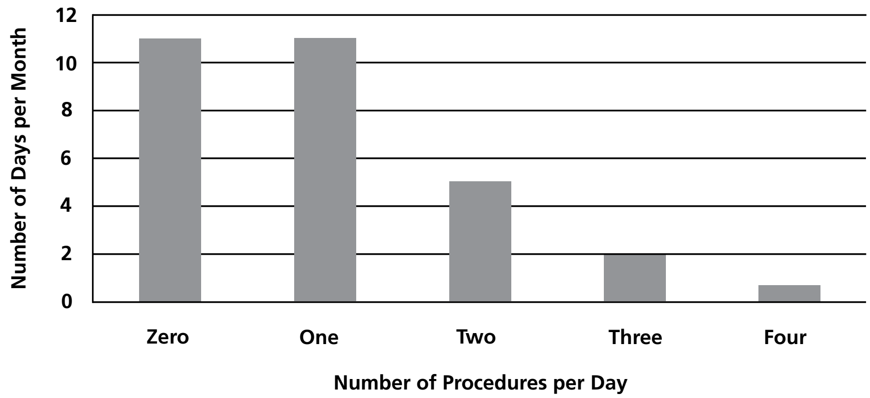


The diamond line tracks the distribution for a facility with an average of one procedure per day. On any given day for this facility, there is a 37 percent chance that there will be zero procedures; and also a 37 percent chance that there will be one (the average). However, there is also an 18 percent chance that there will be two procedures, and a 6 percent chance there will be three procedures.

The triangle line represents the Poisson distribution for an average of 10 procedures in a time period (in the case of MVA needs, a very large hospital clinic). The line begins to approach the normal distribution we are more familiar with. However, the Poisson distribution is important because many of the clinics that need to be supplied with MVA equipment have very small average caseloads. The square line, which represents the Poisson distribution for an average of four procedures per day, has a distribution between the other two lines.

Applying the Poisson distribution to the needs of a health facility clearly shows that the traditional stocking practices are inadequate. To demonstrate this, we will look at a hypothetical example of an ob-gyn center in a district hospital, similar to the diamond line in Graph 1. This center is open every day of the month. It experiences an average monthly caseload of 30, or one per day. However, Graph 2 shows the caseloads that will be experienced on any given day during a month:

Graph 2: Caseload Distribution of a Health Facility With 30 Cases per Month



Note that, on average, there will be no need for MVA equipment on 11 days of the month; similarly, there will be one MVA procedure on 11 days. On average, there will be two procedures on five days in a given month, and three procedures on two days in a month. There will likely be four or more procedures per day several times during any given year. The distribution in Graph 2 represents purely unbiased distribution. When outside factors influence access on a daily basis, such as clients preferring certain days, this will skew the distribution even more.

To meet MVA needs on 95 percent of days, this clinic needs to be stocked for three procedures, meaning three processed instruments in the procedure room, plus one spare, to take into account devices that for one reason or another – inability to hold a vacuum, being dropped or breakage – need to be replaced during the procedure. Therefore, rather than one instrument plus one spare, what is actually needed is four.

RESERVE STOCK BASED UPON MONTHS OF SUPPLY (MOS)

The calculation of the need for reserve stock is carried out using a more traditional supply-chain concept – months of supply (MOS) on-hand. An MOS is the quantity of devices that will be used up in the facility in one month. One MOS is calculated by dividing the number of procedures per month by the expected number of uses in the life of an aspirator.

How long will an Ipas MVA Plus® aspirator last?

- *Fact:* Ipas MVA Plus® aspirators have been successfully tested for being processed 100 times (aspirators were not actually used for procedures in this testing.)
- *Fact:* Ipas recommends that Ipas MVA Plus® aspirators be used for 25 to 50 procedures.
- *Anecdote:* With careful processing, aspirators have lasted for more than 100 uses.
- *Anecdote:* Some aspirators have been reported to break upon first use; others have melted because of overheating during autoclaving.

Conclusion: There is no empirical evidence that documents how long the Ipas MVA aspirator will last; however, the actual average life span is probably significantly greater than 25, perhaps as much as 100. While there is no definitive evidence, many believe that aspirators will last longer if greater care is taken in processing. For the purposes of determining reserve stock, we will use the safer, more conservative figure of 25 uses (the Ipas MVA Plus® is a very robust device and typically lasts longer than 25 uses; other brands may have shorter life spans). However, the lifespan of the devices has no effect on the active stock calculation. Using this assumption will not actually increase the number of instruments used.

In our example clinic there are 30 MVA procedures per month. If we expect a life span of 25 uses for an aspirator:

30 procedures per month ÷ 25 procedures per aspirator = 1.2 aspirators

In most supply chains, the reserve stock in the storeroom should operate on a three-month maximum, with a reorder point of one month of supply. Therefore, in our example clinic:

Maximum reserve stock = 3 x 1.2 = 4 aspirators (rounded)

Reorder point = 1 aspirator (rounded)

Therefore, the instructions to the manager of the storeroom are, "When there is only one aspirator in the storeroom, order three more."

Several notes should be made about this algorithm:

- If the lifetime is more than 25 uses per aspirator, this does not mean that devices will accumulate in the storeroom; it means that the reorder frequency will decrease.
- If resupply is delayed and a stockout occurs in the storeroom, there should still be active stock in the procedure room.
- If resupply is slow, infrequent or unreliable, the maximum and the minimum MOS should be higher than three and one, respectively. For example, in public facilities in Nepal, shipments of equipment occur every six months. In this case the maximum should be eight MOS.
- If resupply is very fast and reliable, the maximum and minimum MOS can be lower. For example, private physicians in Bolivia have ready access to the distributor, with delivery taking less than one week. These facilities can operate with no reserve stock if they have adequate active stock.

1 MOS = number of procedures per month/number of procedures per aspirator

Maximum reserve stock (MAX) = 3 months x 1 MOS

Minimum reserve stock (MIN) = 1 month of stock

Reorder point = MAX – MIN

How many devices should our example ob-gyn center have if it has an average caseload of one per day?

- Active stock in procedure room:

  3 to cover 95% of days + 1 spare = 4 devices

- Reserve stock in storeroom:

  Maximum 4; Reorder point 1
  (number to order when reorder point is reached: 4 – 1 = 3)

- Total maximum devices (start-up)

  Active stock 4 + Reserve stock 4 = 8

USING THE MVA INITIAL SUPPLY AND RESUPPLY TABLE

Based upon these algorithms, we developed a simple table to help MVA service managers stock their facilities. This table can be used for several purposes:

- initial stocking of the procedure room and the facility storeroom;
- maintaining appropriate numbers of MVA equipment in the procedure room;
- supporting resupply decisions by the storeroom manager; and
- planning for facility, regional and national needs.

MVA Initial Supply and Re-Supply
(based on caseload and Poisson distribution)

Active Stock in Procedure Room			Reserve Stock in Facility Store-Room		Planning Data	
A Average caseload per day	B Cases to plan for (95% coverage)	C Active Devices Needed	D Reserve Maximum (3 months of supply)	E Reorder Point (1 month of supply)	F Total Initial Stock	G Devices to Replace Each Year
0.5	2	3	2	0	5	7
1	3	4	4	1	8	15
2	4	6	7	2	13	29
3	6	8	11	3	19	44
4	7	9	15	4	24	58
5	9	11	18	5	29	73
10	16	11*	37	12	48	146

*Two processings per shift or day

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HOW TO USE THE MVA INITIAL SUPPLY AND RESUPPLY TABLE

Step One: Calculate your average caseload (Column A):

As an example, a district hospital ob-gyn center is open for services every day of the month. Upon review of the MVA log, you find that the center has carried out 96 uterine evacuations (UEs) with MVA over the past three months. Therefore, the average caseload is:

96 MVA procedures ÷ 90 days = 1.07 UEs per day (rounded = 1 per day)

If a facility is closed on weekends and holidays, the caseload would be determined by dividing the total number of MVA procedures for three months by 60 days (the estimated number of days the facility would be open during the three months).

Calculate your average daily (or busiest shift) caseload, and round it to the nearest number on the chart. You will need two pieces of information: the total number of MVA procedures performed in the time period and the number of days the facility was open.

(Total number of procedures for past three months) _________ ÷______ (number of days facility was open during those three months) = _____________ (average daily caseload) and round to nearest number on chart.

Locate the row on the table. This is the row you will be using to calculate your needs.

Step Two: Determine your needs for active stock to be kept in the procedure room (Columns B and C):

Column B gives the number of procedures to plan to meet the facility's needs for 95 percent of the days. This means that fewer than one in 20 days will exceed this number of procedures.

Column C gives the number of MVA kits to be kept clean, processed and ready to use in the procedure room. It includes one spare kit for low-volume facilities and two spare kits for higher-volume facilities.

The number for very high-volume facilities assumes multiple processing per session.

Step Three: Develop instructions for reserve stock management in the storeroom (Column D and E):

Column D is the maximum stock that should be held in reserve in case instruments break. The manager of the storeroom should reorder when the stock of new instruments is equal to Column E. The reorder quantity is Column D minus Column E.

- If resupply is slow, infrequent or unreliable, the maximum MOS and the minimum should be higher than three and one, respectively.
- The minimum and maximum MOS can be lower if resupply is very fast and reliable.

Plan for overall needs for initial stock and resupply (Columns F and G)

Column F is the total of Columns C and D. It represents the number of devices needed to totally stock a facility according to the statistically based protocols. This figure can be useful for a new facility being brought online. Alternatively, in order to bring a facility already providing MVA up to protocol standards, the number of devices to supply is Column F minus the existing stock.

Column G provides the number of kits to be used (completed aspirator lifespan and resupplied) per year, based upon the caseload and 25 uses per device. If the number of uses actually experienced is higher, orders will be less frequent and the annual supply needs will be less; conversely, if kits have a lower lifespan, orders will increase and supply needs will be higher. However, we suggest you use these figures for planning purposes until you have data on your own device lifespan, then make adjustments.

MVA Initial Supply and Re-Supply
(based on caseload and Poisson distribution)

Active Stock in Procedure Room			Reserve Stock in Facility Store-Room		Planning Data	
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