**RUNSIM 4: Alarms are handled by Nurse only**

-In RUNSIM 4 we are randomly generating alarms. (run duration, for example - 10 days each day for 24 hours).

Alarms are classified into Nurse alarms and Technician alarms, further classified into true

alarms and false alarms. When there is a nurse alarm or technical alarm, we are assigning nurse

to the patient and when nurse is not available, alarm waits in the queue.

***Scenario1:***

***Queue size is zero:***

-After assigning nurse to the patient, if it is a true alarm, checking whether the alarm is

technical or not. Technical alarm could be something like an equipment issue. Nurse alarm is a genuine (non-technical) alarm which requires intervention from nurse. In RunSim4, both technical & non-technical alarm are handled by nurse.

Same workflow we are doing in case of false alarms too. If it is false alarm, checking whether the alarm is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarm had been switched off, we are tracking the number of dodged false alarm.

If the alarm had been switched off, we are tracking the number of true alarms missed.

Suppose the alarm is switched off then we fake-process the incoming alarms, and they are not handled by anyone and they get departed automatically.

***Scenario2:***

***Queue size is not zero:***

-The alarms inside the queue may be true or false.

When alarm waits inside the queue and nurse is available after some time, they pick it up from the queue (based on their arrival time) and check if it is true alarm or false alarm. In case of true alarm, check it is technical or not.

Now if it is false alarm, then again check it is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarms are missed by nurse then count the number of dodged false alarms.

When true alarm is missed by nurse, we record the number of true alarms missed.

Suppose the alarm is switched off then we fake-process the incoming alarms, and they are not handled by anyone and they get departed automatically.

-At the end we are writing the entire simulation data (for example “no of true or false alarms are missed”) into the Excel file. Some parameters are updated in real-time and get displayed on the output console too:

*Patient Queue Size*

*Number of Working nurse*

*Total number of Service Completions*

*Total number of True Alarms*

*Total number of False Alarms*

*Number of True Alarms Missed*

*Number of False Alarms Serviced*

*Number of False Alarms Dodged*

*Maximum Number of Alarms in Queue*

*Average Number of Alarms in Queue for 2 days*

*tnow (current time)*

PS: Only added parameters above, that are calculated and updated in real time

***RUNSIM5: Alarms are predicted by AI, then true-predicted alarms are handled by nurse***

In RUNSIM5 we are randomly generating alarms. (run duration, for example - 10 days each day for 24 hours).

Alarms are predicted by AI as True or False alarms. And based on AI prediction, Nurse handles the true-predicted alarms .The true-predicted alarms may in reality be either true or false, hence some true alarms will be ignored. So, we also keep track of number of ignored alarms.

***Scenario1:***

***Queue size is zero:***

-After assigning nurse to the patient, if it is a true alarm, checking whether the alarm is

technical or not. Technical alarm could be something like an equipment issue. Nurse alarm is a genuine (non-technical) alarm which requires intervention from nurse. In RunSim5 also, both technical & non-technical alarm are handled by nurse.

Same workflow we are doing in case of false alarms too. If it is false alarm and AI mistakenly predicts it as true, we check whether the alarm is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarm had been switched off, we are tracking the number of dodged false alarm.

If the alarm had been switched off, we are tracking the number of true alarm missed.

Suppose the alarm is switched off or AI has predicted alarm as false, then we fake-process the incoming alarms, and they are not handled by anyone and they get departed automatically.

***Scenario2:***

***Queue size is not zero:***

-The alarms inside the queue may be true or false.

When alarm waits inside the queue and nurse is available after some time, they pick it up from the queue (based on their arrival time) and check if it is true alarm or false alarm as predicted by AI. In case of true alarm, check it is technical or not.

Now if a false alarm is predicted as true alarm by AI, then again check it is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarms are missed by nurse then count the number of dodged false alarms.

When true alarm is missed by nurse, we record the number of true alarms missed.

Suppose the alarm is switched off or AI has predicted alarm as false ,then we fake-process the incoming alarms, and they are not handled by anyone and they get departed automatically.

-At the end we are writing the entire simulation data (for example “no of true or false alarms are missed”) into the Excel file. Some parameters are updated in real-time and get displayed on the output console too:

*Patient Queue Size*

*Number of Working nurse*

*Total number of Service Completions*

*Total number of True Alarms*

*Total number of False Alarms*

*Number of True Alarms Missed*

*Number of False Alarms Serviced*

*Number of False Alarms Dodged*

*Maximum Number of Alarms in Queue*

*Average Number of Alarms in Queue for 2 days*

*Number of True Alarms Missed*

*Number of False Alarms Ignored*

*tnow (current time)*

PS: Only added parameters above, that are calculated and updated in real time

***RUNSIM6: Alarms are predicted by AI, then true -predicted alarms are handled by nurse and false-predicted alarms are handled by technician***

In RUNSIM6 we are randomly generating alarms. (run duration, for example - 10 days each day for 24 hours).

Alarms are predicted by AI as True or False alarms. And based on AI prediction, Nurse handles the true-predicted alarms. Here, a Technician comes into the picture, to help with the nurse load. Each time the nurse decides not to *Process* the alarms (The alarms predicted as false by the AI), Technician processes it and hence this adds to his workload. So we also track the Technician workload.

***Scenario1:***

***Queue size is zero:***

-After assigning nurse to the patient ,if it is a true alarm, checking whether the alarm is

technical or not. Technical alarm could be something like an equipment issue. Nurse alarm is a genuine (non-technical) alarm which requires intervention from nurse. In RunSim6 also, both technical & non-technical alarm are handled by nurse (Do not confuse *technical* with *technician.* Here technician handles the false-predicted alarms only)

Same workflow we are doing in case of false alarms too. If it is false alarm and AI mistakenly predicts it as true, we check whether the alarm is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarm had been switched off, we are tracking the number of dodged false alarm.

If the alarm had been switched off, we are tracking the number of true alarm missed.

Suppose the alarm is switched off or AI has predicted alarm as false, then we fake-process the incoming alarms, and they are handled by technician and then they get departed automatically.

***Scenario2:***

***Queue size is not zero:***

-The alarms inside the queue may be true or false.

When alarm waits inside the queue and nurse is available after some time, they pick it up from the queue (based on their arrival time) and check if it is true alarm or false alarm as predicted by AI. In case of true alarm, check it is technical or not.

Now if a false alarm is predicted as true alarm by AI, then again check it is technical or not. When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarms are missed by nurse then count the number of dodged false alarms.

When true alarm is missed by nurse, we record the number of true alarms missed.

Suppose the alarm is switched off or AI has predicted alarm as false , then we fake-process the incoming alarms, and they are handled by technician and they get departed automatically.

-At the end we are writing the entire simulation data (for example “no of true or false alarms are missed”) into the Excel file. Some parameters are updated in real-time and get displayed on the output console too:

*Patient Queue Size*

*Number of Working nurse*

*Total number of Service Completions*

*Total number of True Alarms*

*Total number of False Alarms*

*Number of True Alarms Missed*

*Number of False Alarms Serviced*

*Number of False Alarms Missed*

*Maximum Number of Alarms in Queue*

*Average Number of Alarms in Queue for 2 days*

*Number of True Alarms Missed*

*Number of False Alarms Dodged*

*tnow (current time)*

*Technicians Workload for True Alarms*

*Technicians Workload for False Alarms*

PS: Only added parameters above, that are calculated and updated in real time

***RUNSIM7: Alarms are predicted by AI, then true-predicted alarms are handled by nurse and false-predicted alarms by technician. Technician also may switch-off alarms due to overload.***

In RUNSIM7 we are randomly generating alarms. (run duration, for example - 10 days each day for 24 hours).

Alarms are predicted by AI as True or False alarms. And based on AI prediction, Nurse handles the true-predicted alarms. The false-predicted alarms are passed on to the technician. The difference from the RunSim6 is that the technician may switch off the technician alarm due to overload, hence technician may also miss alarms.

When there are many false alarms, nurse fatigue kicks in and nurse switches off the alarm. If the alarm had been switched off, we are tracking the number of dodged false alarm.

Similarly, for technician also, fatigue may kick in resulting in ignored alarms. If the alarm had been switched off, we are tracking the number of technical alarm missed.

If the alarm had been switched off(either by nurse or by technician),we are tracking the number of true alarms missed or number of technical alarm missed. .

If the false-predicted alarms are found to be actually true by the technician, then technician will reroute them to the nurse. Such alarms will be counted only when the nurse picks the alarm.

For every alarm, we also keep track whether they have been handled by nurse or technician or both.

Nurse and technician can search their next alarm from the common queue, where all the alarms are waiting.

-At the end we are writing the entire simulation data (for example “no of true or false alarms are missed”) into the Excel file. Some parameters are updated in real-time and get displayed on the output console too:

*Patient Queue Size*

*Number of Working nurse*

*Total number of Service Completions*

*Total number of True Alarms*

*Total number of False Alarms*

*Number of True Alarms Missed due to nurse fatigue*

*Number of False Alarms Serviced – Nurse*

*Number of False Alarms Dodged – Nurse*

*Maximum Number of Alarms in Queue*

*Average Number of Alarms in Queue for 2 days*

*Number of True Alarms Handled – Technician*

*Number of False Alarms Handled – Technician*

*tnow (current time)*

*Technicians Workload for True Alarms*

*Technicians Workload for False Alarms*

*Nurse Workload for True Alarms*

*Nurse Workload for False Alarms*

*No of technician alarm missed due to fatigue*

*Rate of switching off the alarms – Nurse*

*Rate of switching off the alarms – Technician*

*Queue Size*

PS: Only added parameters above, that are calculated and updated in real time