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Single Server Queuing Model for Outpatients at the RSUD Toto Bone Bolango of Gorontalo Province HerlinaJusuf * Gorontalo State University, Indonesia Corresponding Author : herlina_jusuf@yahoo.co.id ABSTRACT Introduction : A queue is occurrence often found in daily life .Because left took a while is a valuable resources and the reduction of time waiting for the draw for analysis , so that this research to evaluate the system of the queue on outpatient services at the RSUD Toto Bone Bolango for 14 days of work .

Methods : Non reactive is a kind of this research , with the data as a secondary analysis .The data is outpatients at thehospital Bone Bolango Toto district of Gorontalo Province. Results :The results of research with a system of a queue m / m / 1 obtained ? = 0.7

meaningful busy services officer of 70 percent from time programs as well as the proportion of 30 percent no patients in the system .L = 2.23 meaningful the number of outpatients in the system as many as three participants, two participants are in a queue, each participant was served. .Patients waiting for served lq = 1.54 or long his line two patients .Time spent a patient , w = 4.8 minutes plus the time during which served .Wq = 0.05 each hour or wq = 3,18 minutes meaningful patients be in a queue waiting for served during 0.05 hour or 3,18 minutes.

A system of a queue of M/M/1 is still an effective system and if considered a queue too long needs to be add second servant or worker or change in the characteristics of the arrival of the queue as efforts to improve services to outpatients in RSUD Toto Bone Bolango Keyword:Queue, M/M/1, Poisson Introduction Queuing process is a process associated with the arrival of patients at a care facilities then wait in a queue (if all

servers are busy) and eventually left the facilities.

The interesting thing is whether the arrival of patients, whether that person comes one by one or in groups, and whether the balking or reneging allowed. Balking occurs when a patient has been in a queue, leaves the queue and designated care facilities because that person waited too long (Bustoni: 2005). If not mentioned specifically, the standard assumption is all of the patients arrive one by one and there is no balking and reneging.

The time of arrival fulfilling the Poisson distribution which equivalent to the fact that between times of arrival is exponential occur randomly and independent from one another. The exponential distribution is widely used in the field of statistics, especially in the theory of reliability and the waiting time or queuing theory (Walpole: 1986). The exponential distribution is very important because it is often assumed that the time of a server in the queue's system is exponential.

It is difficult to explain about why the server time should be in exponential form, but in fact server time is very close to the exponential form (Stallings, 2003). Poisson distribution is also important for queue's analysis because we have to assume the patterns of Poisson arrival to build queue's equations, because generally assuming Poisson arrivals is valid (Stallings, 2003). Queue's discipline is a rule when the customers serve.

This rule is based on the first-in first-out (FIFO) which is serving in the order of arrival, and the last-in first-out (LIFO) which is customer who came last would get the next services or based on priorities. To assess the problem above, the purpose of this study is to analyze the effectiveness of the queue's system that occur during the care of outpatients, also to analyze whether the queue's single server (M/M/1 system) as a single server server is still an effective model for the care of outpatients in Gorontalo's Toto Bone Bolango Hospital.

Review ofLiterature Queue's Characteristics Queues are characterized by the five components (Bustanul, 2010, Mulyono, 2007): The Arrival Pattern Arrival pattern is usually characterized by inter-arrival time which is the time between the arrivals of two sequential patients at a care facility. This pattern can be deterministic (known with

certainty) or in the form of a random variable whose probability distribution is considered to have been known.

This pattern may depend on the number of patients who are in the system or not. The Server Pattern Server pattern characterized by server time (server time) is the time it takes a server to serve a patient. Server time can be deterministic or random variable probability distribution considered to have been known.

This quantity can depend on the number of patients who have been in care facilities or not depends on the circumstances. The interesting thing is whether the only serviced by one server or customer requires a single server. If not mentioned specifically, then the basic assumption is that only one ministry has been able to serve the affairs of a patient completely.

Total Servers Total servers in a server system is very important, in this case is closely related to the existing queue's system. System Capacity System capacity is the number of patients, including those being served and who are in the queue so that it can be accommodated by the care facilities at the same time.

When a patient comes to a care facility that is full then the patient is balked to enter and also not allowed to wait outside (because it will increase the capacity) and forced to leave the facility without getting care, a system that does not limit the number of patients in its care facility has infinite capacity while a system that limits the number of patients has a finite capacity.

Generally, assumption that exists is assumption about an infinite queue's size, so the queue's wait can expand without limit. In the infinite queue, an item (the patient) can be lost from the system. In practice, the queue is finite (Stallings, 2003). Queue's discipline Queue's discipline is the rule where patients are served based on the first in, the first out (FIFO) and serve based on the order of arrival which is the last in, the first out (LIFO), for example, patients who came last would get the next server by randomly or based on priorities.

The main task of queue is a queuing system for analyzing the effectiveness of the case,

which is involves four outputs, those are waiting patients, waiting times, patients in queue and queue's time, so I want to know about the average value of the output earlier. Queuing System A queuing system is a set of patient server and a rule that govern customer arrival and processing of the problem (Bronson, 1988).

A queue is a birth-death process with a population consisting of patients who are waiting to get the service or being serviced. A birth occurs when a patient came to a care facility, while if patients leave any such facilities then there is a death. Queues have multiple systems (Heizer, 2005) M/D/2/5/TMPK System Is a system that the arrival time has an exponential distribution form, deterministic server time, has two servers can accommodate five people at the same time with the provision that final customer is a customer came next the entry to be serviced (last in first out). D/D/1 System Has the arrival time and server time are both deterministic with only one server.

Because the capacity of the system and discipline are not characterized, then it considered similar to FIFO (first in first out). M/M/s System A queuing process that has a Poisson arrival pattern with a number of servers S that are not interdependent but the server time of each is identical to follow an exponential distribution form that is not dependent on the state of the system, its capacity is finite and queue discipline FIFO.

M/ M/1/K System Accommodate most patients K in the care facilities at the same time. If a care facility is full then the patients who come in will be balked and not allowed to wait outside. M/M/s/K System Is a system characterized by the amount of server as much as S and each has times identical servers but are not interdependent, which is distributed exponentially. The capacity of the system must be s = K.

M/M/1 System Is an inter-arrival time queue has exponential probability distribution with parameter μ, a server, an unlimited system capacity and the queue discipline is first come first served. With t is the rate of arrival of the average patients and μ is the average server rate. Among the expected time of arrival and the time servers are expected to serve a patient is a row 1/t and 1/μ.

System M/M/1, referred to a single server queuing system servers with an infinite capacity to have a Poisson distribution for the output and the exponential distribution

for time ministry. This server system called single server system which is the simplest form of the system queues (Kotler, 2002) Because outpatients care systems in Gorontalo's Toto Bone Bolango hospital are using the system M/M/1 queuing system in the form of a single service then there is some measure of the effectiveness of the characteristics: Population customers unlimited First in, first out Poisson arrival rate Exponential service time Above characteristics assuming t <μ Where t = μ = the arrival rate and service level.

Methods Research Design This research is a non reactive research (unobtusif) "a measurement whereby people who researched did not realize that they are part of a research for measuring individual and does not interfere with individuals do not feel bothered, because what is involved is the information obtained from him in the past which are currently recorded in the data secondary (Kuntoro, 2010) using secondary data as a secondary analysis (data analysis) with the main emphasis is to analyse the effectiveness of the queue by using queue theory single service system (single server system).

Source Of Data Source of data in this research is a secondary data of outpatients at the hospital Toto Bone Bolango of Gorontalo province for 14 days of work infebruary 2015 . Technique Analysis Data The main task of the queue analysis is aware of information the time of arrival and services as input item. while items waiting for , waiting time , item-item and wait time of the queue as output .Who wanted to know about specifically about the outputs is the value of the average of the output .

` Methods of Data Analysis To calculate the average number in the system The average time of service??= ????????-???????? ????????????????? ?? Determine the intensity of traffic queues .The probability that a servant was busy (that is the probability of a patients being waited)??= ?? ?? = Determine the average number of patients in the system.

L = ?? ??- ?? Determine the average number of patients is waiting to be served Lq = ?? 2 ?? ??- ?? Determine the average time that spent by a patient in the system. in this case is the time of the queue in minutes .The time of the queue (W) = 1 ??- ?? Determine the average time that spent by a patient in the queue. In this case waiting time .Waiting

time Ws = ?? ?? ??- ?? (Kakiay, 2004) Results and Discussion The SAS System 19:52 Thursday, April 23, 2009 1 jumlah_kunjungan perhari 104.38095 waktu_pelayanan_efektif 3.6 laju_kedatangan 28.994709 myu menit myu jam 1.4346171 41.823007 e rho L Lq W jam W menit Wq jam Wq menit 20.084639 0.6932717 2.2602148 1.5669431 0.0779527 4.6771599 0.0540424 4.6771599 From the output above obtained : The average number of outpatients in RSUD Toto Kabupaten Bone Bolango Province Gorontalo each day is X = 104,38 person each day or 104 each day for 21 days of work in February 2015 .

The average time of effective service (t) outpatients at the RSUD Toto Kabupaten, Bone Bolango for five days of work which is 3.6 hours a day The average rate of arrival (T) outpatients at RSUD Toto Kabupaten, Bone Bolango is 28.99 person per hour or rounded 29 people The average time services to anyone person of outpatients at RSUD TotoKabupaten Bone Bolango(??) = 1,43 minutes .

Meaningful one of participant served by officers with 1,43 minutes each time The average length of time services to any one person outpatients at RSUDToto Kabupaten.Bone Bolango (??) = 42 people each hour. Meaningfull in an hourservices officer may serve outpatients at RSUD Toto kabupaten, Bone Bolango Province Gorontalo atotal of 42 people. 1.

Determine the intensity of traffic queues where : ?? = 29 participants and ??= 42 participants each hours, so obtained ??= 0.69 ~ 0.7 meaningful??= 0.7 Where the service will be busy as much as 70 percent of the working time or there are 30 percent The proportion of no customers patients in the system. ??= 0.8 which??< 1 So there a circumstance that tunak as a condition that must be fulfilled then fourth the size of effective may be analyzed 2.

Determine the number of avarage patients in a system (L), L = 2.23., Meaningful the number of outpatients at the RSUD Toto kabupaten .Bone bolango the average in the system is as many as 3 (three) participants or 2 (two) participants who are in the ranks of the queue with 1 one of participants was serve. 3. Determine the average number of patients waiting to be served (lq). Lq = 1,54 or 2 people Meaningful the number of outpatients at the RSUD Toto Kabupaten .Bone Bolango the average waiting to be served is 2 (two) participants or long a queue is 2participants. 4.

Determine the average time spent a patients in the system in this time where timethe queue a queue (w) = 4.8 minutes. So the average time spent by outpatients at RSUD Toto Kabupaten .Bone Bolango in a system of 4.8 minutes .It is meaningful that during 4.8 minutes patients are in the system during their stay namely in a line of a queue coupled with the time duringwhich served . 5.

Determine the average time spent by a patients in a queue Waiting Time :Wq = 0.05 each hour or Wq = 3,18 minutes So the average time spent by a patient in a queue of 3.18 minutes .Meaningful that a customer be in a queue to wait served is as long as 0.05 hour or 3,18 minutes .

Queue theory basically can be used to analyze the effectiveness of queue and apply it to a place.One of the essential assumption of the theory was at the queue of the exponential and the steady state probability tunak(a). Arrival time between distributed in ekspnensial shows that the arrival time sufficiently rapidly than average occurring concurrently with the very old.

The result is that some patients that come within a short time, thus producing a queue.After a while it lasted a long in which nonew patients that come to allow reduction of the line. The intensity of traffic queues (??) to be sought more time before analyze , where in the queue of traffic intensity ??= 0.7

meaningful that has occurred because a state of being tunak because ??< 1 (as a requirement to be analyzed) so fourth the size of effective can be analyzed . By using the theory of the queue and effectiveness of the queue system can be analyzed what happened, where the number of outpatients at the hospital Toto Kabupaten Bone Bolango the average in the system as much as 3 (three) people and the number of patients waiting to be served a total of 2 peoplewhile 1 (one) man was being served .The average time spent by an outpatients in the queue is for 4.8

minutes while the average time spent by a outpatients in RSUD Toto Kabupaten Bone Bolango in the system is as long as 3,18 minutes . The results of a system where the queue can be evaluated which manager or the leader of the RSUD Bone Bolango have

to consider the time of busy waiter of 70 percent and 30 percent of leisure , waiting time of outpatients 0.05 hours with long queues formed is 3 participants .This can be inferred from the results of the queue which means that does not happen so do no harm at the hospital outpatients KabupatenToto Bone Bolango the queue and also the prevailing system in RSUD Toto Bone Bolango at the time registration outpatients with outpatients most of the queue system is effective with only the use of a servant , could serve with either the whole outpatients on each day by the time short enough.

So the system of M/M/1 still an effective system of the queue is used at the time the registration of outpatients at the RSUD Toto kabupatenBolango Province Gorontalo. CONCLUSION A queue system at the time the registration outpatients in RSUD Toto Kabupaten Bone Bolango Province Gorontalois still a system that effective with only use a servant namely systemm / m / 1 because it can serve with either the whole outpatients on each day withenough time brief.

ADVICE if this result could yet accepted or still considered a queue too long needs to be added or second servant done other changes in characteristics the arrival of the queue as efforts to increase services to outpatients in Toto Kabupaten RSUD. Bone Bolango Province Gorontalo.

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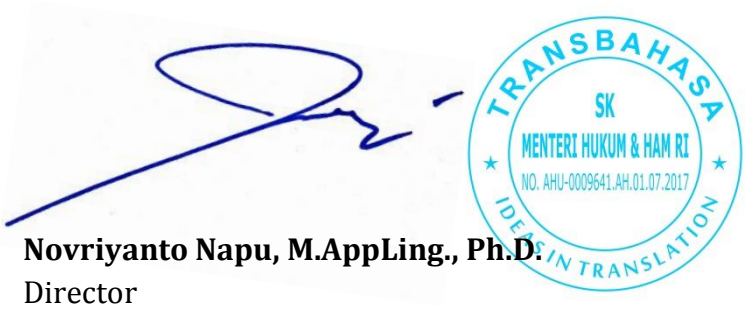

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