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# STUDENT VERSION
# MULTIPLE DRUG DOSES

Brian Winkel, Director
SIMIODE
Cornwall NY USA

## STATEMENT

You are to design an intravenous drug administration plan for a 24 hour span for a hospital patient. The patient has a port or shunt to their vein so medicine can be administered without further "sticking." This medicine is to be administered in such a way that the amount of the drug in their blood stream must be between 2 and 4 mg throughout the 24 hour period. To go over 4 mg is to risk adverse effects and to go under 2 mg is to possibly not benefit from the drug. The drug is absorbed into the tissues where it does its work at the rate of 50% of the amount present in the bloodstream per hour.

There are two options:

1. bolus or plug injection of a set amount of the drug at fixed time intervals or
2. continuous drip administration of the drug over set time intervals.

We know that, "In medicine, a bolus (from Latin bolus, ball) is the administration of a discrete amount of medication, drug or other compound in order to raise its concentration in blood to an effective level."[1]

Because of possible shock effect the drug can be administered in any amount for no more than 1/2 hour of each hour long time interval.

Here are the taskings for you:

1. Build a mathematical model for (1) and (2) approaches, if possible, prescribing initial dosing and drug administration to comply with requirements.
2. What criterion would you use to compare these two approaches? Determine and demonstrate your optimal solution.

3. If you find one of these approaches is not possible, then modify the approach to make it possible and demonstrate that possibility.

## REFERENCES

[1] Wikipedia contributors. Bolus (medicine). Wikipedia, The Free Encyclopedia. https://en.wikipedia.org/w/index.php?title=Bolus_(medicine)&oldid=738637625. Accessed 12 October 2016.