(Hospital) The cost per day of running a hospital is 300,000+0.75$x^2$ dollars, where *x* is the number of patients served per day. What number of patients served per day minimizes the cost per patient per day of running the hospital if the hospital's daily capacity is 200 patients?

## Discussion: -

As per the problem we understand that per day cost of running a hospital is depended on the number of patients served on that day. So, our decision variable will be the number of patients served per day. Our objective is to minimize the cost per patient cost which is the Daily total cost divided by the number of patients served per day. If we go with this function, solver encounters an error when it tries zero as a variable. To solve this problem, we should add a minimal number (0.01) in the denominator of the function in order to get rid of the error message which we are facing while running solver.

### Mathematical Model: -

*Parameters (Inputs):*

$A$ : $Hospital\ daily\ capacity\ (200)$

*Decision Variables:*

$x$ : $Number\ of\ patients\ served\ per\ day$

*Calculated Variables:*

$C = 300000 + 0.75\ (x^2)$; $\quad Daily\ total\ cost$

*Objective:*

$$Minimize\ per\ patient\ cost = \frac{C}{(x + 0.01)}$$

*Constraints:*

$x \leq A$ $\qquad$ $(1)\ Hospital\ daily\ capacity$

*Excel Implementation:* Please find the attached spreadsheet for solution.

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|---|---|---|---|---|---|
| | Patients | 200 | <= | 200 | Inputs |
| | Cost | 330000 | | | Decision variables |
| | | | | | Calculated Variables |
| | Cost per patient | 1650 | | | Constraints |
| | | | | | Objective |