

Solution for exercise 2.2.4 in Pitman

First we note

$$P(\text{More than 120 patients helped}) = 1 - P(\text{At most 120 patients helped})$$

and we apply The Normal Approximation to the Binomial Distribution page 99 for the second term i.e. we want to evaluate $P(\text{At most 120 patients helped})$.

We have $\mu = n \cdot p = 300 \cdot \frac{1}{3} = 100$ and $\sigma = \sqrt{300 \frac{1}{3} \frac{2}{3}} = 10\sqrt{\frac{2}{3}}$. The value of b in the formula is 120 (more than 120). As there is no probability mass to be subtracted we do not include the a term. We get

$$P(\text{More than 120 patients helped}) = 1 - \Phi\left(\frac{120.5 - 100}{8.165}\right) = 1 - \Phi(2.51) = 1 - 0.994 = 0.006$$