



# Predicting Hospital NoShows

(or “Putting Predictions to work”)

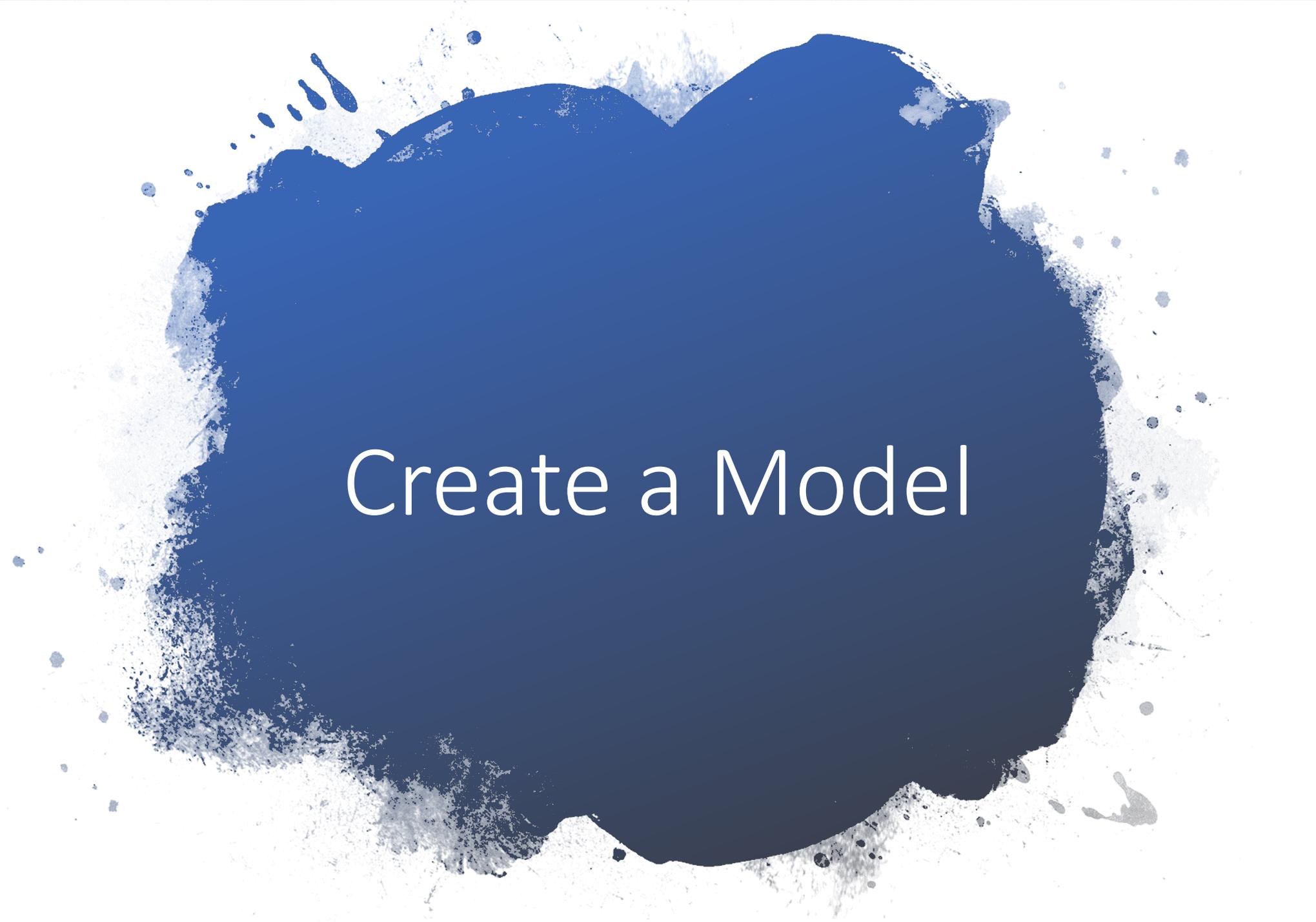
Austin Powell

# NoShows

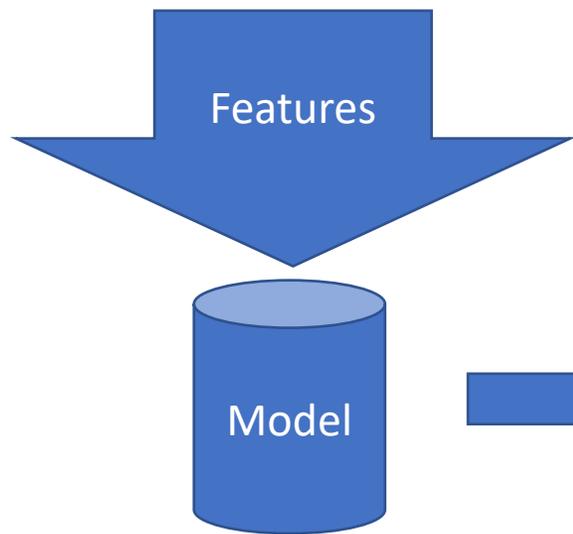
*NoShows: Anything less than a cancellation more than 24hrs out*

## Implications of NoShows

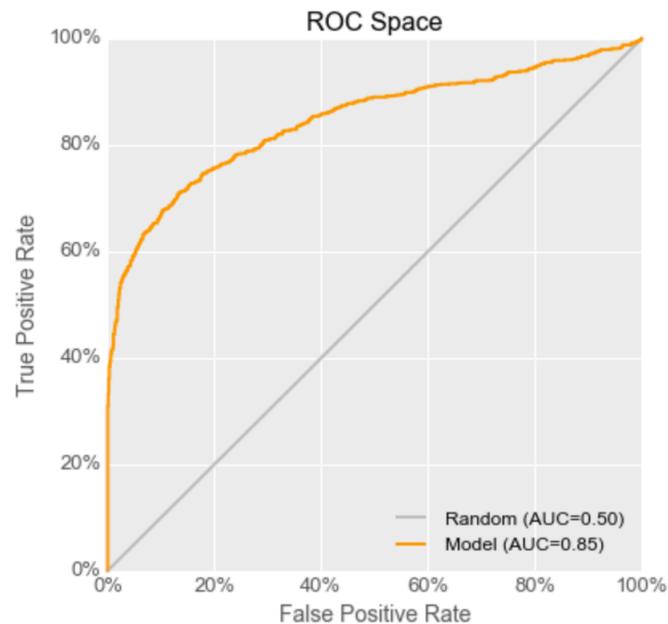
- Unfilled appointment cost
- Cost of clinician idle time
- Additional wait-time for some other patient (potentially quit sever)

A dark blue, irregularly shaped graphic with a splatter effect, containing the text "Create a Model". The graphic has a rough, hand-painted appearance with various shades of blue and white splatters around its edges. The text is centered within the dark blue area in a clean, white, sans-serif font.

Create a Model



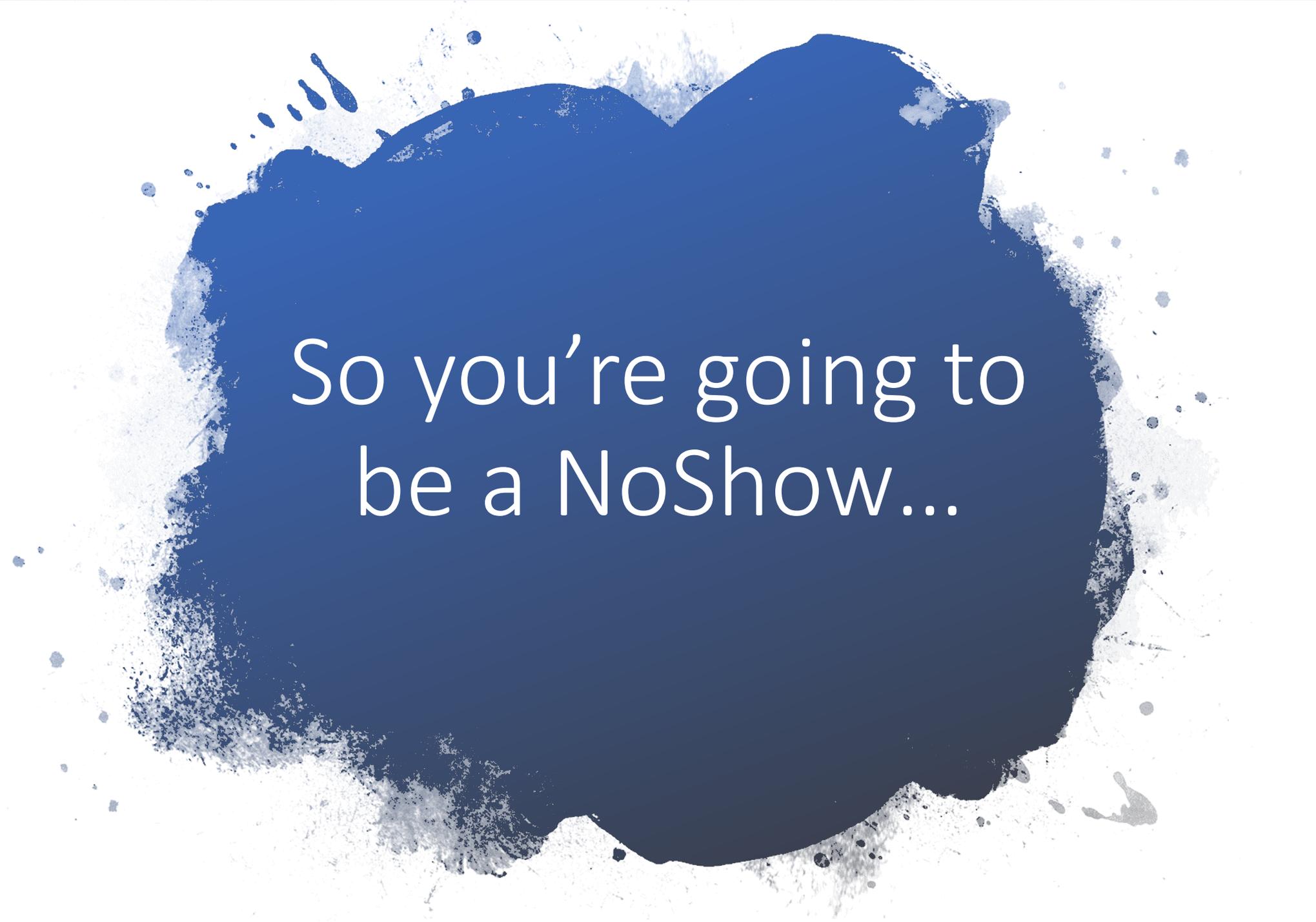
# Mitigating the cost factor with a confusion matrix



|                              | Actual Patient NoShow   |   |
|------------------------------|---|---|
|                              | Action Needed   | No Action Needed  |
| NoShow Output at threshold t | <p><b>Positive</b></p> <p><u>True Positive</u></p> <ul style="list-style-type: none"> <li>Utility(t) = \$ It depends</li> <li>Rate(t) = TPR(t) * 92%</li> </ul>         | <p><b>False Positive</b></p> <ul style="list-style-type: none"> <li>Utility(t) = - \$ call center</li> <li>Rate(t) = FPR(t) * 8%</li> </ul> |
|                              | <p><b>Negative</b></p> <p><u>False Negative</u></p> <ul style="list-style-type: none"> <li>Utility(t) = - \$ operational</li> <li>Rate(t) = (1-TPR(t)) * 92%</li> </ul> | <p><b>True Negative</b></p> <ul style="list-style-type: none"> <li>Utility(t) = + \$</li> <li>Rate(t)=(1-FPR(t)) * 8%</li> </ul>            |

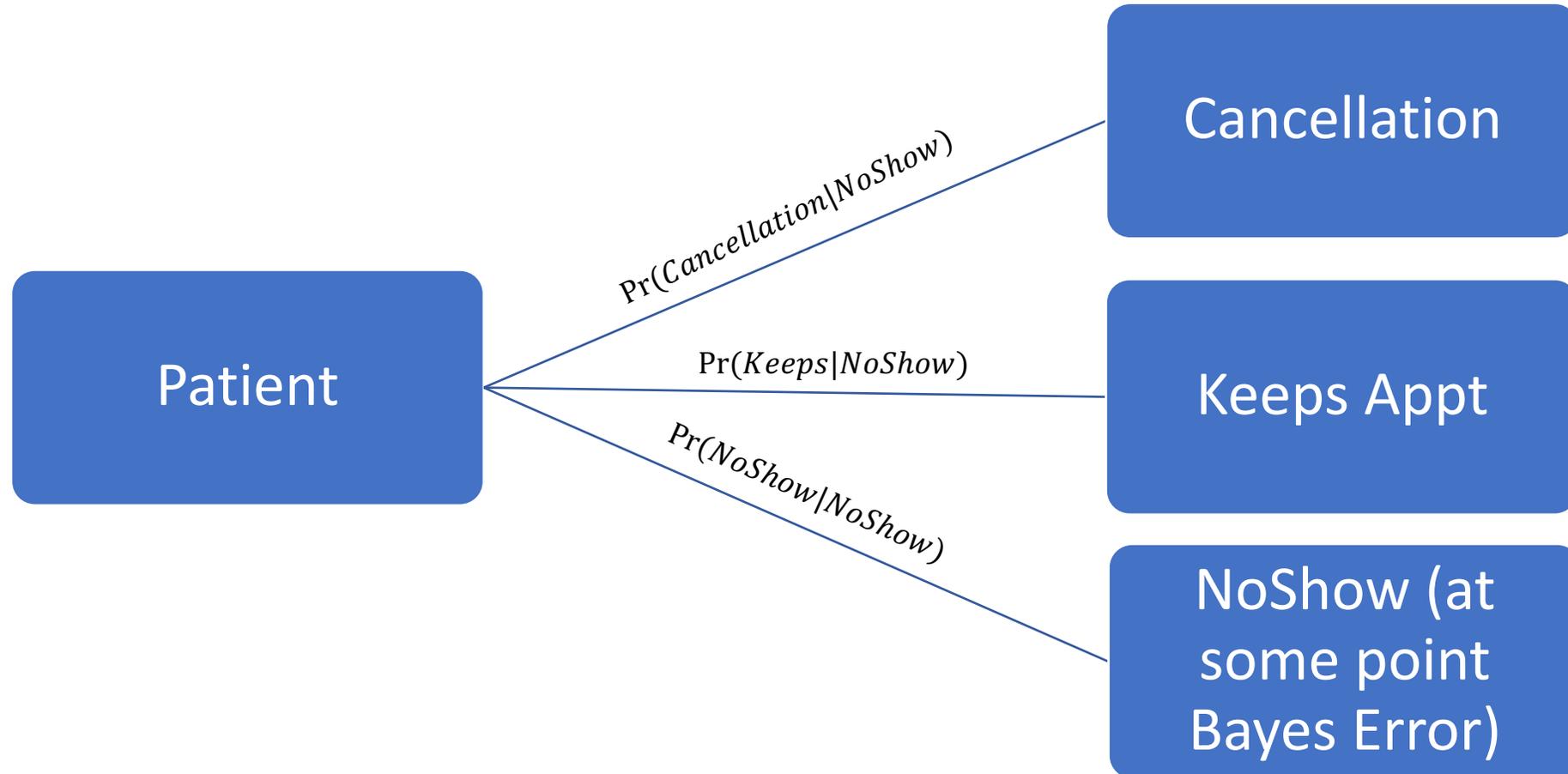
Expected utility of model (or “average utility”)

$$E[u] = u_{tp}r_pTPR + u_{fn}r_p(1 - TPR) + u_{fp}r_nFPR + u_{tn}r_n(1 - FPR)$$

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So you're going to  
be a NoShow...

# Converting NoShows

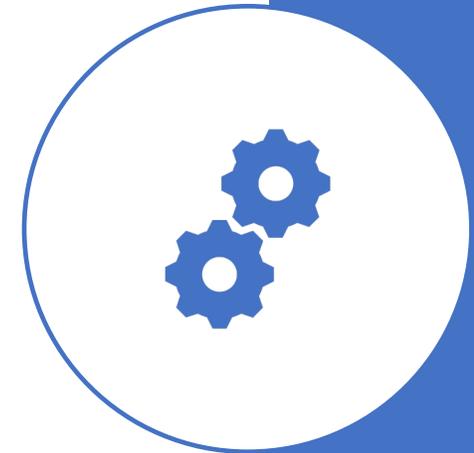


# Optimization Goal

Overall goal:

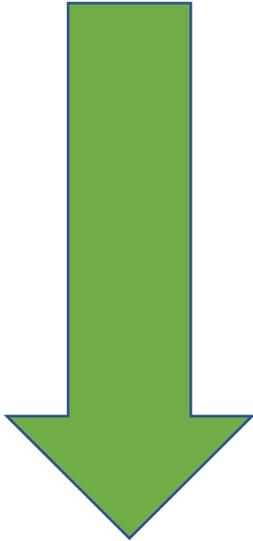
$$\min(\Pr(\text{NoShow}|\text{NoShow}, \text{FNR}))$$

- **FNR (False Negative Rate)** Can be minimized primarily through modeling choices
- **$\Pr(\text{NoShow}|\text{NoShow})$**  could be minimized through strategic outreach.
  - A/A testing models for effectiveness
  - A/B testing different outreach methods
- **Wait list optimization:** How to best fill the predicted empty spot?

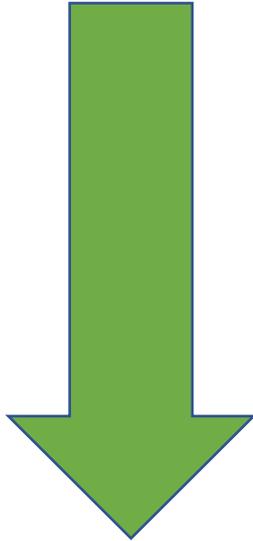


At the end of the day...

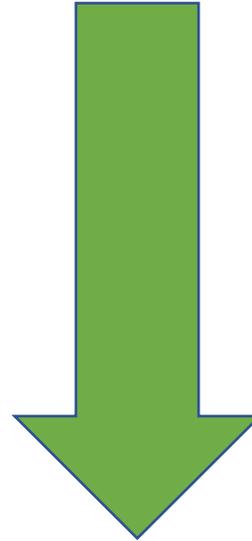
**Costs**



**Wait Times**



**Less Bias**



A dark blue, irregularly shaped graphic with a splatter effect, containing the text "Thank you!" in white. The graphic has a rough, hand-painted appearance with various shades of blue and white splatters around its edges. The text is centered within the dark blue area.

Thank you!

# Appendix

(Slides that didn't make the cut)

airport, including any stopovers, in the **agreed sequence**. 'No-show' policies mean that if someone does not travel on their outbound flight, then all other connecting or return flights associated with the booking will be **automatically cancelled**. New tickets will need to be purchased for returning or connecting flights, if travel on these flights is still intended.

It is important to note that someone who no-shows may **not be eligible for a refund** or be able to re-book if no seats are available on other flights. As stated in the airline's Contract of Carriage, many fares becomes non-changeable on the day of departure.

## HOW CAN I AVOID BEING A NO-SHOW ?

# Industry Comparison: Considerations for actions

|             | Airlines         | Hospital              |
|-------------|------------------|-----------------------|
| Charges     | Charges up front | Charges after service |
| Overbooking | Yes              | No                    |
| Bayes Error | < 5%             | < 15%                 |