Model	Relative Cost Y:N	Overall Accuracy (% correct Y & N)	Sensitivity (Y accuracy)	Specificity (N accuracy)
1	1:1	85%	45%	97%
2	9:1	49%	97%	35%
3	4:1	81%	68%	85%

This table analyzes three different **Decision Tree Classification Models** for predicting **Congestive Heart Failure (CHF) readmission**. Each model uses a different **relative cost ratio** for misclassifying "Yes" (will be readmitted) and "No" (won't be readmitted).

Understanding the Columns

1. **Relative Cost Y:N**
   - This adjusts how much more important it is to correctly classify "Yes" cases compared to "No" cases.
   - **Higher Y:N ratios** prioritize detecting readmissions (Yes).
   - **Lower Y:N ratios** keep a balance between detecting both Yes and No cases.
2. **Overall Accuracy (% correct Y & N)**
   - The percentage of all correctly classified cases (both Yes & No).
   - **Higher isn't always better**—we must also check Sensitivity and Specificity!
3. **Sensitivity (Y Accuracy - Readmitted Cases) Recall**
   - How well the model detects **actual readmissions (Yes cases).**
   - **Higher sensitivity** means the model correctly identifies more high-risk patients.
4. **Specificity (N Accuracy - Non-Readmitted Cases)**
   - How well the model detects **non-readmitted patients (No cases).**
   - **Higher specificity** means fewer false positives (wrongly predicting a patient will be readmitted).

Breaking Down Each Model

Model	Relative Cost (Y:N)	Overall Accuracy	Sensitivity (Y Accuracy)	Specificity (N Accuracy)
1	**1:1** (Equal weight)	**85%**	**45%**	**97%**
2	**9:1** (Strong bias for "Yes")	**49%**	**97%**	**35%**
3	**4:1** (Moderate bias for "Yes")	**81%**	**68%**	**85%**

Interpreting the Models

Model 1 (Baseline Model) → 1:1 Cost Ratio

✅ **Good Overall Accuracy (85%)**
❌ **Poor Sensitivity (Only 45% of readmissions detected)**
✅ **High Specificity (97%) → Few false positives**

- **Problem?** It **misses** many actual readmissions (false negatives).

Model 2 (Overcompensating for "Yes") → 9:1 Cost Ratio

❌ **Low Overall Accuracy (49%)**
✅ **High Sensitivity (97%) → Detects almost all readmissions**
❌ **Very Low Specificity (35%) → Too many false positives**

- **Problem?** Too many **false positives**, meaning **many patients are wrongly flagged as high-risk.**
- **This leads to unnecessary interventions.**

Model 3 (Balanced Approach) → 4:1 Cost Ratio

✅ **Good Overall Accuracy (81%)**
✅ **Higher Sensitivity (68%) → Detects more readmissions**
✅ **High Specificity (85%) → Fewer false positives than Model 2**

- **Best balance between detecting readmissions and avoiding unnecessary interventions.**

Conclusion: Best Model?

☞ **Model 3 (4:1 Cost Ratio) is the best balance!**

- It improves **Sensitivity** (detecting real readmissions) without sacrificing too much **Specificity** (wrongly predicting healthy patients as readmissions).
- **Model 1 was too weak at predicting readmissions.**
- **Model 2 overcompensated, causing too many false alarms.**