

# CPAP Mask Selection Algorithm

Complete 12-Factor Integration System

Comprehensive Documentation

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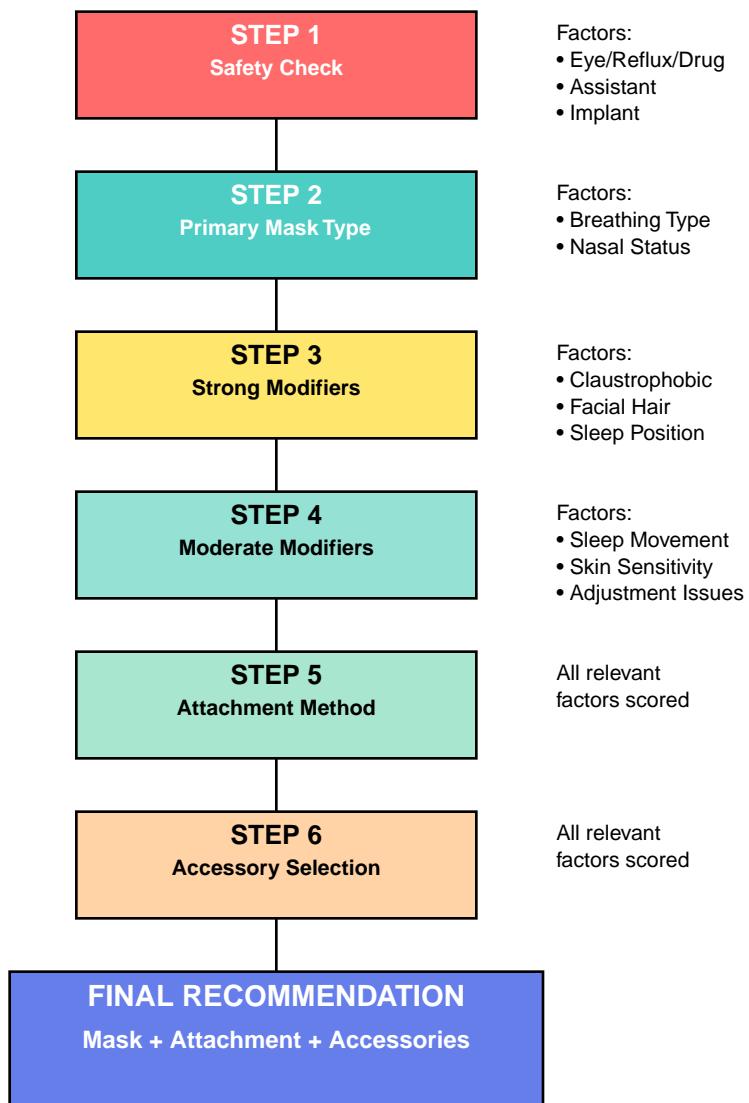
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# **Introduction**

This document describes the comprehensive CPAP mask selection algorithm that systematically integrates all 12 assessment factors with proper weighting, interaction logic, and decision routing.

The algorithm uses a 6-step decision process that ensures safety constraints are met first, then determines the primary mask type, applies modifiers, and selects appropriate attachments and accessories.

# Algorithm Flow Overview



# Factor Hierarchy & Weights

## TIER 1: Critical Safety (Weight: 100)

Assistant • Eye/Reflux • Drug • Implant

## TIER 2: Primary Determinants (Weight: 95-85)

Breathing Type • Nasal Obstruction

## TIER 3: Strong Modifiers (Weight: 80-70)

Claustrophobic • Facial Hair • Sleep Position

## TIER 4: Moderate Modifiers (Weight: 60-50)

Sleep Movement • Skin Sensitivity • Adjustment Issues

# Factor Hierarchy & Weights

## Tier 1: Critical Safety Factors (Weight: 100 - Absolute)

These create hard constraints that override other factors.

### **Assistant (Weight: 100)**

Impact: Attachment method REQUIRED

Decision Rule: Magnetic quick-release or easy-removal mandatory

### **Eye/Reflux (Weight: 100)**

Impact: NO FULL FACE (aspiration risk)

Decision Rule: Must use nasal-only masks

### **Drug (Vomiting) (Weight: 100)**

Impact: NO FULL FACE (aspiration risk)

Decision Rule: Must use nasal-only masks

### **Implant (Weight: 70)**

Impact: NO MAGNETIC (interference risk)

Decision Rule: Use non-magnetic attachments only

## **Tier 2: Primary Mask Type Determinants (Weight: 95-85)**

These are the primary factors that determine mask category.

### **Breathing Type (Weight: 95)**

Impact: Primary mask category

Decision Rule: Mouth !' Full Face; Nose !' Nasal; Mixed !' Approaches

### **Nasal Obstruction (Weight: 90)**

Impact: Modifies mask category

Decision Rule: Severe !' Full Face; Mild !' Dual; None !' Nasal

## **Tier 3: Strong Modifier Factors (Weight: 80-70)**

These significantly influence mask selection within category.

### **Claustrophobic (Weight: 80)**

Impact: Strong preference modifier

Decision Rule: Prefer nasal pillows (minimal contact) over other options

### **Facial Hair (Weight: 75)**

Impact: Seal quality constraint

Decision Rule: AVOID traditional nasal cushions; prefer pillows or total face

### **Sleep Position (Weight: 70)**

Impact: Design feature requirement

Decision Rule: Side/stomach !' tube-up designs; back !' any design

## **Tier 4: Moderate Modifier Factors (Weight: 60-50)**

These influence comfort and attachment selection.

### **Sleep Movement (Weight: 60)**

Impact: Stability requirement

Decision Rule: High movement !' enhanced headgear + prefer pillows

### **Skin Sensitivity (Weight: 55)**

Impact: Material/cushion selection

Decision Rule: Gel/fabric options; hypoallergenic materials required

### **Adjustment Issues (Weight: 50)**

Impact: Attachment simplification

Decision Rule: Auto-adjusting or simplified designs preferred

# Questions, Choices, and Decision Mapping

This section details the exact questions asked, available answer choices, and how each choice influences the algorithm's decisions.

## Tier 1: Critical Safety Factors

### 1. Assistant (Weight: 100)

Question: "Do you require assistance to remove the mask in an emergency?"

Answer Choices:

- Yes
- No

Decision Mapping:

- Yes !' requiresEasyRemoval = true; Requires magnetic quick-release or easy-removal mechanism
- No !' No special removal requirement

### 2. Eye/Reflux (Weight: 100)

Question: "Do you have eye issues or severe acid reflux that could cause aspiration?"

Answer Choices:

- Yes
- No

Decision Mapping:

- Yes !' canUseFullFace = false; CRITICAL: Must use nasal-only masks (aspiration risk)
- No !' Full face masks allowed if otherwise appropriate

### 3. Drug/Vomiting (Weight: 100)

Question: "Do you take medications that cause vomiting or nausea?"

Answer Choices:

- Yes
- No

Decision Mapping:

- Yes !' canUseFullFace = false; CRITICAL: Must use nasal-only masks (aspiration risk)
- No !' Full face masks allowed if otherwise appropriate

### 4. Implant (Weight: 70)

Question: "Do you have any medical implants (pacemaker, defibrillator, etc.)?"

Answer Choices:

- Yes
- No

Decision Mapping:

- Yes !' canUseMagnetic = false; Must use non-magnetic attachments only
- No !' Magnetic attachments allowed if otherwise appropriate

## Tier 2: Primary Mask Type Determinants

### 5. Breathing Type (Weight: 95)

Question: "How do you primarily breathe during sleep?"

Answer Choices:

- Nose only
- Mouth only
- Mixed (both nose and mouth)

Decision Mapping:

- Nose only ! Primary: Nasal Mask/Pillows (85-90% success if no obstruction)
- Mouth only ! Primary: Full Face Mask (80-85% success, if safe)
- Mixed ! Full Face OR Nasal + Chin Strap (75-85% success)

### 6. Nasal Obstruction (Weight: 90)

Question: "Do you have any nasal obstruction or issues?"

Answer Choices:

- No obstruction
- Mild obstruction
- Severe obstruction
- Deviated septum
- Seasonal allergies

Decision Mapping:

- No obstruction ! Ideal for nasal masks; no modification needed
- Mild obstruction ! Consider dual approach or full face
- Severe obstruction ! REQUIRES Full Face Mask (if safe)
- Deviated septum ! Full Face preferred (if safe)
- Seasonal allergies ! Consider heated humidifier accessory

## **Tier 3: Strong Modifier Factors**

### **7. Claustrophobic (Weight: 80)**

**Question:** "Do you experience claustrophobia or discomfort with things covering your face?"

**Answer Choices:**

- Yes
- No

**Decision Mapping:**

- Yes + Nasal Mask !' SWITCH to Nasal Pillows (minimal contact)
- Yes + Full Face !' Select minimal-contact models (F40, F30, Amara View)
- No !' No modification based on this factor

### **8. Facial Hair (Weight: 75)**

**Question:** "Do you have facial hair (beard, mustache)?"

**Answer Choices:**

- Yes
- No

**Decision Mapping:**

- Yes + Nasal Mask !' REQUIRED switch to Nasal Pillows (traditional cushions fail to seal)
- Yes + Full Face !' Select total face mask OR full face + fabric liners
- No !' No modification based on this factor

### **9. Sleep Position (Weight: 70)**

**Question:** "What is your primary sleep position?"

**Answer Choices:**

- Back
- Side
- Stomach
- Sitting upright

**Decision Mapping:**

- Back !' Any design acceptable; no tube-up requirement
- Side !' REQUIRES tube-up design (top-of-head tubing for pillow compatibility)
- Stomach !' REQUIRES tube-up design (top-of-head tubing for pillow compatibility)
- Sitting !' May indicate underlying condition; consider medical evaluation

## **Tier 4: Moderate Modifier Factors**

### **10. Sleep Movement (Weight: 60)**

**Question:** "How much do you move during sleep?"

**Answer Choices:**

- Very little movement
- Some movement
- Move all the time

**Decision Mapping:**

- Very little !' Standard headgear sufficient
- Some !' Standard headgear usually sufficient
- Move all the time !' REQUIRES Enhanced 4-point headgear; prefer Nasal Pillows over Nasal Mask

### **11. Skin Sensitivity (Weight: 55)**

**Question:** "Do you have sensitive skin or allergies to silicone/materials?"

**Answer Choices:**

- Yes
- No

**Decision Mapping:**

- Yes !' REQUIRES gel, fabric, or memory foam cushions; hypoallergenic materials
- Yes !' Prioritize: AirTouch (fabric), DreamWear Gel, or soft silicone options
- No !' Standard silicone cushions acceptable

### **12. Adjustment Issues (Weight: 50)**

**Question:** "Do you have difficulty adjusting straps or headgear (arthritis, dexterity issues)?"

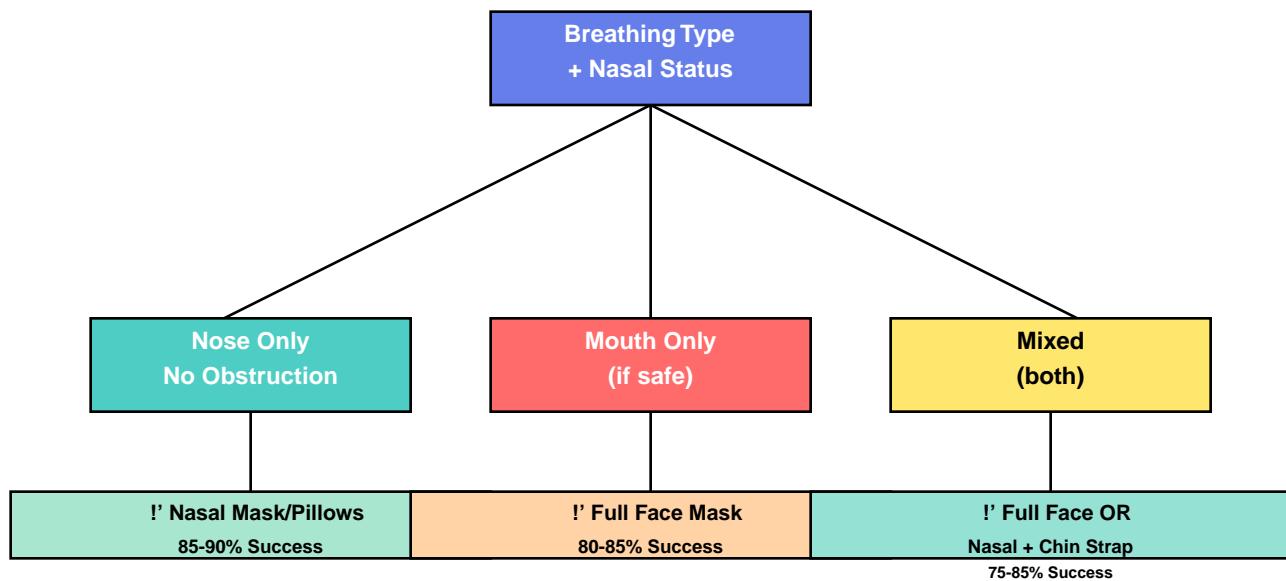
**Answer Choices:**

- Yes
- No

**Decision Mapping:**

- Yes !' Prefer magnetic quick-release attachments (if no implant)
- Yes !' Prefer auto-adjusting or simplified designs
- No !' Standard attachments acceptable

# Decision Tree: Primary Mask Type



# Complete Decision Algorithm

## STEP 1: Safety Check (Critical Constraints)

The algorithm first checks for critical safety constraints that create hard limitations:

- Eye/Reflux/Drug conditions !' NO FULL FACE (aspiration risk)
- Assistant required !' EASY REMOVAL REQUIRED (magnetic or quick-release)
- Implant present !' NO MAGNETIC attachments

**These constraints override all other factors and must be respected.**

## **STEP 2: Primary Mask Type (Breathing + Nasal)**

Determines the base mask category based on breathing pattern and nasal status:

- Nose-only + No obstruction !' Nasal Pillows/Mask (85-90% success)
- Mouth-only !' Full Face (80-85% success, if not contraindicated)
- Mixed !' Full Face OR Nasal + Chin Strap (75-85% success)
- Deviated Septum !' Full Face preferred
- Seasonal Allergies !' Consider heated humidifier

## **STEP 3: Apply Strong Modifiers**

Applies high-weight factors that significantly modify the recommendation:

### **Claustrophobic (Weight: 80):**

- If Nasal Mask !' Switch to Nasal Pillows (minimal contact)
- If Full Face !' Select minimal-contact designs (F40, F30, Amara View)

### **Facial Hair (Weight: 75):**

- If Nasal Mask !' REQUIRED switch to Nasal Pillows (traditional cushions fail)
- If Full Face !' Add fabric liners OR use total face design
- Contraindication: AVOID traditional nasal cushion masks

### **Sleep Position (Weight: 70):**

- Side/Stomach !' Prioritize tube-up designs (P30i, N30i, DreamWear)
- Back !' Any design acceptable
- Sitting !' May indicate underlying condition (consider evaluation)

## **STEP 4: Apply Moderate Modifiers**

Applies medium-weight factors that refine comfort and attachment needs:

### **Sleep Movement (Weight: 60):**

- High movement ! Enhanced 4-point headgear required
- Consider Nasal Pillows for better seal retention

### **Skin Sensitivity (Weight: 55):**

- Select gel/fabric/memory foam options
- Required accessories: Gel cushions, hypoallergenic silicone, fabric covers
- Best options: AirTouch series (memory foam), Gel cushions

### **Adjustment Issues (Weight: 50):**

- Prefer auto-adjusting headgear
- Magnetic clips ideal (if no implants)
- Simplified designs with fewer adjustment points

## **STEP 5: Attachment Method Selection**

Scores all attachment options based on relevant factors:

### **Magnetic Quick-Release:**

- Score: 100 if Assistant required (REQUIRED)
- Score: 90 if Adjustment issues (Highly recommended)
- Score: 0 if Implant present (CONTRAINDED)

### **Auto-Adjusting Headgear:**

- Score: 90 if Adjustment issues
- Score: 60 otherwise (generally beneficial)

### **Enhanced 4-Point Headgear:**

- Score: 85 if High movement (REQUIRED)
- Score: 70 if Some movement

### **Over-the-Head Design:**

- Score: 75 if Side/Stomach sleeper (RECOMMENDED)
- Score: 50 otherwise

## **STEP 6: Accessory Selection**

Determines required and recommended accessories:

### **ESSENTIAL Accessories:**

- Heated Humidifier: Required for mouth breathing or seasonal allergies

### **HIGHLY RECOMMENDED Accessories:**

- Gel Cushions/Memory Foam: For skin sensitivity
- Hypoallergenic Silicone: For allergies
- Fabric Cushion Covers: For facial hair or skin sensitivity

### **RECOMMENDED Accessories:**

- Chin Strap: For mixed breathing with nasal mask trial
- Mouth Tape (MyoTape): Alternative to chin strap (if safe)

# Complete Integration Example

## Example Patient Profile:

- Breathing: Nose-only
- Nasal: No obstruction
- Sleep Position: Side
- Sleep Movement: All the time
- Claustrophobic: Yes
- Facial Hair: Yes
- Adjustment Issues: Yes
- Skin Sensitivity: Yes

## Decision Flow:

### STEP 1 - Safety Check:

- ' Can use full face (no eye/drug issues)
- ' Can use magnetic (no implants)
- ' No easy removal required

### STEP 2 - Primary Mask Type:

- Initial: Nasal Pillows or Nasal Mask (85-90% success)

### STEP 3 - Strong Modifiers:

- Claustrophobic !' Switch to Nasal Pillows
- Facial Hair !' Confirm Nasal Pillows REQUIRED
- Side Sleeper !' Prioritize tube-up designs

### STEP 4 - Moderate Modifiers:

- High Movement !' Enhanced headgear required
- Skin Sensitivity !' Soft materials + accessories
- Adjustment Issues !' Magnetic or auto-adjusting

## FINAL RECOMMENDATION:

- Primary Mask: ResMed AirFit P30i (tube-up, side-sleeper friendly)
- Alternative: Philips DreamWear Silicone Pillows
- Attachment: Magnetic Quick-Release Headgear
- Accessories: Gel cushions, hypoallergenic silicone, fabric covers
- Success Rate: 80-90%

# Algorithm Summary

## Key Features:

- Systematic 6-step decision process
- Explicit factor weighting (100, 95, 80, 70, 60, 55, 50)
- Complete interaction logic between factors
- Safety constraints override all other factors
- Specific mask model recommendations with rationale
- Complete traceability (why each factor matters)

## Factor Coverage:

- ALL 12 factors systematically considered
- Tier 1: Critical safety (absolute constraints)
- Tier 2: Primary mask type (category determination)
- Tier 3: Strong modifiers (significant influence)
- Tier 4: Moderate modifiers (comfort refinement)

## Output Quality:

- Specific mask models (not just categories)
- Complete reasoning for each recommendation
- Success rate estimates
- Required and recommended accessories
- Contraindications and warnings