ENTITY VALUE | DECISION PACK

# Emergency Department Workforce Policy Comparison

Sample — Synthetic Data | Prepared by Doogooda (Entity Value)

DECISION STATEMENT

**Under an annual budget of ₩4.2B and a headcount cap of 45 FTEs, how should the hospital structure its emergency department workforce to achieve cost-effective operations without compromising quality of care?**

## Current Baseline

| Annual Budget | Headcount Cap | Current Wait Time | Analysis Period |
|---|---|---|---|
| **₩4.2B** | 45 FTEs | Avg. 47 min<br>(Target: ≤30 min) | Jan 2024 – Dec 2025<br>24 months, 128,400 visits |

SUMMARY OF FINDINGS

**Recommendation: Option A (Shift Optimization) — +18 QALY improvement with zero additional budget**

If additional budget available: Option C (Hybrid) is optimal (ICER ₩9.03M/QALY, 85.1% probability of cost-effectiveness)

*Prepared by: Entity Value (Doogooda) | Date: [Date] | Version: 1.0*

*Classification: Confidential | For internal decision-making use only*

# 1. Cost-Effectiveness Analysis (CEA)

Three workforce alternatives and the status quo are compared on a cost-effectiveness basis. Effectiveness is measured in Quality-Adjusted Life Years (QALYs).

## 1.1 Alternatives

| Alternative | Description |
|---|---|
| **Option A Shift Optimization** | Keep existing 45 FTEs. Redesign shift schedules to concentrate staffing during peak hours (nights/weekends). Redistribute weekday morning staff to high-demand periods. No additional cost. |
| **Option B Specialist Expansion** | Hire 3 additional emergency medicine specialists (total 48). Requires ₩6.5B/year (+₩2.3B over budget). Requires board/committee approval for budget override. |
| **Option C Hybrid** | Shift optimization (Option A) + 2 part-time specialists. Maintains 45 FTE cap + 2 PT. Requires ₩4.48B/year (+₩280M over budget). |
| **Status Quo** | No changes to current staffing. Average wait time remains 47 minutes. Comparison baseline. |

## 1.2 Cost-Effectiveness Comparison

| | Option AShift Optimization | Option BSpecialist Expansion | Option CHybrid | Status Quo |
|---|---|---|---|---|
| **Annual Cost** | ₩4.2B (within budget) | ₩6.5B (+₩2.3B over) | ₩4.48B (+₩280M over) | ₩4.2B |
| **Effectiveness (QALY)** | 312 QALY (Δ +18) | 328 QALY (Δ +34) | 325 QALY (Δ +31) | 294 QALY (baseline) |
| **Expected Wait Time** | 32 min (target met) | 24 min (exceeds target) | 27 min (target met) | 47 min (target not met) |
| **ICER (ΔCost/ΔQALY)** | **Dominant (same cost, better outcome)** | ₩19.12M/QALY | **₩9.03M/QALY** | — (baseline) |
| **Verdict** | **Cost-Effective (Dominant)** | Over budget Approval required | Cost-Effective (meets ₩50M/QALY threshold) | Inefficient |

**Key finding: Option A improves outcomes by 18 QALYs at zero additional cost, making it a dominant strategy. If budget can be expanded, Option C achieves 31 QALY improvement at an ICER of ₩9.03M/QALY — well below the Korean cost-effectiveness threshold of ₩50M/QALY.**

## 2. Budget Impact Analysis (BIA)

Three-year budget impact by alternative. Annual budget cap: ₩4.2B.

| | Option AShift Optimization | Option BSpecialist Expansion | Option CHybrid | Status Quo |
|---|---|---|---|---|
| **Year 1** | ₩4.2B (within budget) | ₩6.5B (+₩2.3B over) | ₩4.48B (+₩280M over) | ₩4.2B |
| **Year 2** | ₩4.2B (efficiency gains) | ₩6.69B (salary increases) | ₩4.43B (learning effects) | ₩4.2B |
| **Year 3** | ₩4.15B (cost reduction) | ₩6.87B (cumulative excess) | ₩4.4B (stabilized) | ₩4.2B |
| **3-Year Cumulative** | **₩12.55B (within budget)** | **₩20.06B (+₩7.46B over)** | **₩13.31B (+₩710M over)** | ₩12.6B |

**Option A operates within budget for all 3 years. Option B requires ₩7.46B in additional funding over 3 years — not feasible without board approval. Option C requires ₩710M over 3 years, potentially fundable through operational savings.**

## 3. Probabilistic Sensitivity Analysis (PSA)

10,000 Monte Carlo simulations were run to assess uncertainty in ICER estimates.

### 3.1 Probability of Cost-Effectiveness

| Alternative | Prob. of CE(₩50M/QALY threshold) | ICER Range(95% CI) | Decision Risk |
|---|---|---|---|
| **Option A: Shift Optimization** | **97.2%** | Dominant – ₩8M/QALY | Low Robust conclusion |
| **Option B: Specialist Expansion** | 48.3% | ₩12M – ₩28M/QALY | High Conclusion changes under varied assumptions |
| **Option C: Hybrid** | **85.1%** | ₩4M – ₩15M/QALY | Moderate Sensitive to PT labor costs |

### 3.2 Key Sensitivity Parameters

| Parameter | Base Value | Range Tested | Impact on Conclusion |
|---|---|---|---|
| **Night shift premium multiplier** | 1.35x | 1.25x – 1.50x | No change Option A remains dominant |
| **Wait time target** | 30 min | 20 min – 45 min | At 20 min target: Option C becomes necessary |
| **PT hourly labor cost** | ₩35,000/hr | ₩30,000 – ₩45,000 | At ₩45,000: Option C ICER rises, Option A strengthened |
| **ED visit growth rate** | 3%/year | 0% – 8% | Above 5%: Option B/C necessity increases. Review recommended. |

## 4. Decision Rule

The following conditional logic guides the recommendation based on budget availability:

| Condition | Recommended Action |
|---|---|
| **No additional budget (₩4.2B fixed)** | Implement Option A (Shift Optimization)<br>→ Zero additional cost, wait time 47 min → 32 min, +18 QALY |
| **Budget expandable by ₩280M (₩4.48B total)** | Implement Option C (Hybrid)<br>→ Wait time 27 min, +31 QALY, ICER ₩9.03M/QALY (85.1% probability) |
| **Budget expandable by ₩2.3B (₩6.5B total)** | Option B (Specialist Expansion) becomes feasible but Option C preferred<br>→ Option B ICER ₩19.12M/QALY with only 48.3% certainty. Option C is more efficient. |
| **Wait time target tightened to 20 min** | Option A alone is insufficient. Minimum Option C required.<br>→ Request re-analysis with updated target. |

## 5. What Changes My Mind

| # | Trigger Condition | Why It Matters | Action |
|---|---|---|---|
| T1 | ED visit volume grows >5%/year | Current staffing cannot meet wait time target even with optimized shifts | Evaluate Option C or B.<br>Budget negotiation required. |
| T2 | Staff turnover exceeds 15%/year post-shift change | Shift optimization may be causing dissatisfaction | Pause shift redesign.<br>Conduct staff survey.<br>Re-analyze. |
| T3 | Medical fee schedule revision changes ED reimbursement | Cost structure changes may invalidate CEA conclusions | Re-run analysis with new fee schedule.<br>1-month turnaround. |
| T4 | Budget cap raised to ₩4.5B+ | Option C becomes immediately feasible | Skip Option A standalone.<br>Go directly to Option C. |

## 6. Audit Trail

| Item | Detail |
|---|---|
| **Decision Owner** | [Deputy Director], [Hospital / Institution Name] |
| **Analysis Prepared By** | Lina Song, CEO, Doogooda (Entity Value) |
| **Data Period** | January 2024 – December 2025 (24 months, 128,400 ED visits) |
| **Methodology** | Queuing simulation (M/M/c) → Cost-effectiveness analysis (CEA/ICER) → Budget impact analysis (BIA) → Probabilistic sensitivity analysis (PSA, 10,000 iterations) |
| **Alternatives Evaluated** | 4 (Options A, B, C, Status Quo). Option D (outsourcing expansion) and Option E (night ED closure) were evaluated and rejected. See Appendix C. |
| **Recommendation** | Option A (Shift Optimization) — 97.2% probability of cost-effectiveness.<br>Expand to Option C if budget becomes available. |
| **Review Triggers** | T1–T4 documented above.<br>Next scheduled review: 6 months post-implementation or upon trigger event. |
| **Version** | v1.0 — [Date] \| Next update: 6 months post-implementation or upon trigger event |

### Appendices

| Appendix | Contents |
|---|---|
| **A** | Methodology detail: Queuing model parameters, QALY estimation basis, discount rate, PSA parameter distributions |
| **B** | Data sources: Datasets used, collection periods, preprocessing methods, exclusion criteria |
| **C** | Rejected alternatives: Option D (outsourcing) and Option E (night closure) evaluation results and rejection rationale |
| **D** | PSA results detail: Cost-effectiveness acceptability curve (CEAC), cost-effectiveness plane (CE Plane) visualizations |