

# COST-EFFECTIVE CARE FOR MASSIVE BURNS: A MARKOV ANALYSIS

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Introduction

Massive burns (>50% TBSA) remain the most complex and expensive traumas seen in hospitals worldwide.

>50%

Mortality Rate

>5

# Major Acute Surgeries

>\$500K

Cost per Surgery



Treatment is uniquely challenging due to limited or no donor skin.

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Systemic injury +/- polytrauma

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4% increase in mortality risk per %TBSA

Skin Expansion Techniques



Cultured Epithelial Autograft (CEA)

- Confluent sheet of epithelial cells  
- 3-week production time  
- Older, more established

Suspension Autografts

- Aerosol cell suspension  
- Point-of-care  
- Newer, outcomes not as robust

Objective

To investigate the relative cost-utility of confluent CEAs versus cell suspension autografts for the treatment of massive partial thickness burns (>50% TBSA).

Novelty

This is a first-of-its-kind study investigating cost-effectiveness for massive burns.

Methods

This was a cost-effectiveness analysis comparing CEAs versus spray keratinocytes in adults with massive burn injuries (>50% TBSA).



Direct Costs:

- 2024 Medicare reimbursement fee schedule  
- Manufacturer data

Indirect Costs:

- Productivity lost, using 2024 US hourly wage



Utilities:

- Vancouver Scar Scale -> used as proxy for QALYs

Results

Model Data

| Study                                 | Design                                  | Population                                                                                                               | Sample Size                                                      | Outcome Measures                                                           | Mean Follow Up | Graft Survival |
|---------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------|----------------|----------------|
| CEAs                                  |                                         |                                                                                                                          |                                                                  |                                                                            |                |                |
| (Carsin et al. 2000)                  | Prospective Cohort Investigation        | Patients ≥ 18 years with partial or full thickness burns treated with Epicel + allograft                                 | N = 30                                                           | (1) Graft take                                                             | 114 days       | 69%            |
| (Hickerson, Remmers, and Recker 2018) | Retrospective Cohort Investigation      | Patients ≥ 22 years with burns treated using Epicel + STSG                                                               | N = 628                                                          | (1) Graft take<br>(2) Survival                                             | 12 months      | 73%            |
| (Sood et al. 2010)                    | Prospective Cohort Investigation        | Patients ≥ 18 years with partial to full thickness burns                                                                 | N = 68                                                           | (1) Graft take<br>(2) Survival                                             | 90 months      | 73%            |
| Suspension Autografts                 |                                         |                                                                                                                          |                                                                  |                                                                            |                |                |
| (Holmes IV et al. 2018)               | Randomized Clinical Trial               | Patients 18-65 years who sustained a partial to full thickness thermal burn with a minimum treatment area of 200-640 cm² | N = 30 subjects per study arm (ReCell® + STSG versus STSG alone) | (1) Wound closure at week 8<br>(2) Quality of Life using POSAS             | 12 months      | 97%            |
| (Gravante et al. 2007)                | Randomized Clinical Trial               | Patients 30-65 years who sustained partial to full thickness thermal burns                                               | N = 25 subjects per study arm (ReCell® + STSG)                   | (1) Wound closure<br>(2) Aesthetic appearance per the Vancouver Scar Scale | 6 months       | 84%            |
| (Hickerson et al. 2019)               | Prospective Observational Investigation | Patients ≥ 18 years with >50% TBSA burns                                                                                 | N = 22 subjects treated with ReCell® + STSG                      | (1) Wound closure<br>(2) Physician assessment of aesthetic appearance      | 8 weeks        | 87%            |

To Tip the Needle...

At their current market cost, CEAs would have to clinically outperform suspension autografts at a 4x rate to meet the current US standard willingness to pay threshold.

THREE-STATE MARKOV MODEL

Successful Re-Epithelialization  
(includes complications managed without surgery)

Graft Failure  
(includes late graft failure - infection)

Complications Requiring Reoperation  
(e.g., poor graft take due to infection, graft dislocation, hematoma)

Markov State Transition Diagram

Base Case Outcomes: Wound Closure

73%

CEA

68%

SUSPENSION AUTOGRAFT

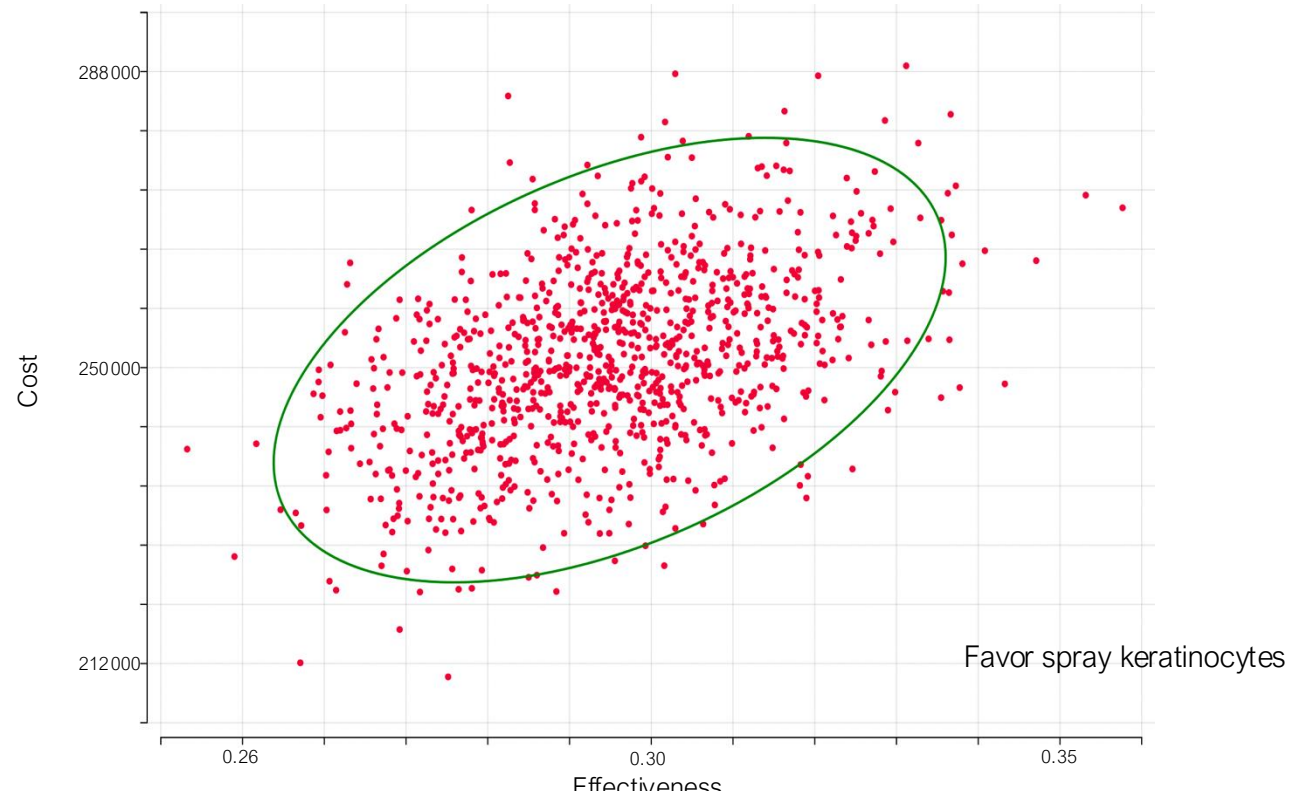
Base Case

Suspension Autografts versus CEA

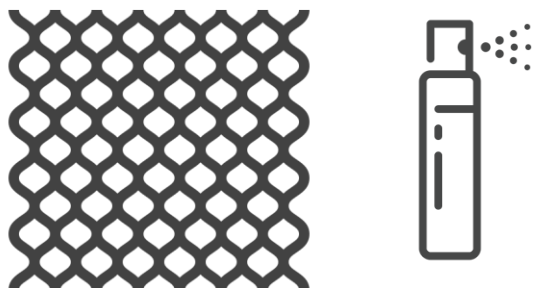
|                                 | Health Systems Perspective | Societal Perspective |
|---------------------------------|----------------------------|----------------------|
| Incremental costs per patient   | -\$254,743                 | -\$780               |
| Incremental utility per patient | +0.16                      | +0.36                |
| ICER                            | Dominant                   | Dominant             |

Suspension autografts were the dominant strategy.

Sensitivity Analyses



Conclusions



Suspension autografts are more cost-effective for massive burn care than CEAs, with similar outcomes but substantial decreases in costs across both health systems and society.

Significance

Suspension autografts represent an important paradigm shift in massive burn care.

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No external processing or specialized facility

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Faster time to initial grafting

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Shorter overall length of stay

Limitations & Next Steps

- Limitations: limited literature, QoL estimated from VSS
- Next Steps: multicenter work, longitudinal data

References

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