Dermatology & Plastic Surgery Institute

Cleveland Clinic

2016
Outcomes

Measuring Outcomes Promotes Quality Improvement

Measuring and understanding outcomes of medical treatments promotes quality improvement. Cleveland Clinic has created a series of Outcomes books similar to this one for its clinical institutes. Designed for a physician audience, the Outcomes books contain a summary of many of our surgical and medical treatments, with a focus on outcomes data and a review of new technologies and innovations.

The Outcomes books are not a comprehensive analysis of all treatments provided at Cleveland Clinic, and omission of a particular treatment does not necessarily mean we do not offer that treatment. When there are no recognized clinical outcome measures for a specific treatment, we may report process measures associated with improved outcomes. When process measures are unavailable, we may report volume measures; a relationship has been demonstrated between volume and improved outcomes for many treatments, particularly those involving surgical and procedural techniques.

In addition to these institute-based books of clinical outcomes, Cleveland Clinic supports transparent public reporting of healthcare quality data. The following reports are available to the public:

- Joint Commission Performance Measurement Initiative (qualitycheck.org)
- Centers for Medicare and Medicaid Services (CMS) Hospital Compare (medicare.gov/hospitalcompare), and Physician Compare (medicare.gov/PhysicianCompare)
- Cleveland Clinic Quality Performance Report (clevelandclinic.org/QPR)

Our commitment to transparent reporting of accurate, timely information about patient care reflects Cleveland Clinic's culture of continuous improvement and may help referring physicians make informed decisions.

We hope you find these data valuable, and we invite your feedback. Please send your comments and questions via email to:

OutcomesBooksFeedback@ccf.org.

To view all of our Outcomes books, please visit clevelandclinic.org/outcomes.

Dear Colleague:

Welcome to this 2016 Cleveland Clinic Outcomes book. Every year, we publish Outcomes books for 14 clinical institutes with multiple specialty services. These publications are unique in healthcare. Each one provides an overview of medical or surgical trends, innovations, and clinical data for a particular specialty over the past year. We are pleased to make this information available.

Cleveland Clinic uses data to manage outcomes across the full continuum of care. Our unique organizational structure contributes to our success. Patient services at Cleveland Clinic are delivered through institutes, and each institute is based on a single disease or organ system. Institutes combine medical and surgical services, along with research and education, under unified leadership. Institutes define quality benchmarks for their specialty services and report on longitudinal progress.

All Cleveland Clinic Outcomes books are available in print and online. Additional data are available through our online Quality Performance Reports (clevelandclinic.org/QPR). The site offers process measure, outcome measure, and patient experience data in advance of national and state public reporting sites.

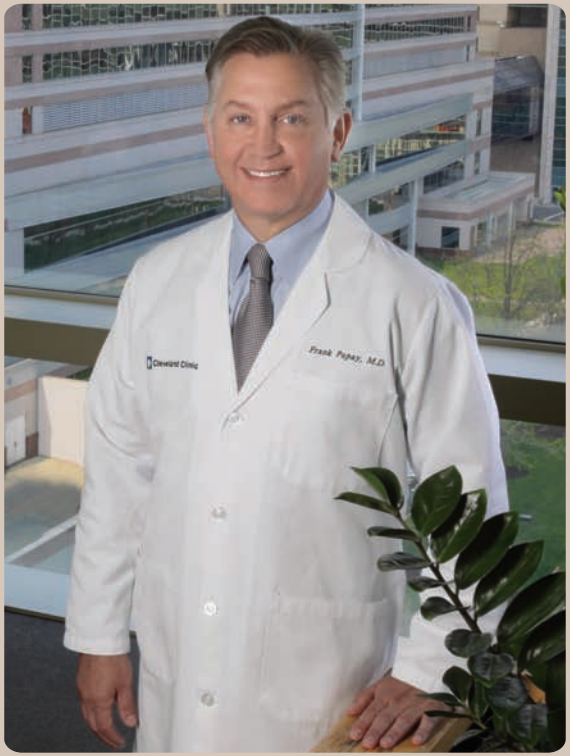
Our practice of releasing annual Outcomes books has become increasingly relevant as healthcare transforms from a volume-based to a value-based system. We appreciate your interest and hope you find this information useful and informative.

Sincerely,

Delos M. Cosgrove, MD
CEO and President

what's inside

Chairman's Letter



Dear Colleagues,

I am pleased to present the 2016 Outcomes for Cleveland Clinic's Dermatology & Plastic Surgery Institute. This book highlights the institute's trends and innovations for all referring physicians, alumni, potential patients, and others nationwide.

As we expand our collaboration with primary care to improve value of care, we continue our history of innovative practice with composite tissue allografts. Following the performance of this country's first face transplant in 2013, our teams are preparing for a hand transplantation.

Selected highlights of 2016:

- Expansion of telemedicine activity, including eVisit development and a Tele-opinion program for primary care and Express Care® providers, to reduce redundant appointments and improve patient access
- Further advancement of research efforts with vascularized composite allografts (VCA), hand, and wound care
- New education efforts, including a symposium with oncology providers to collaborate on clinical strategies to improve melanoma care; an Education Day for primary care colleagues on dermatologic conditions, surgical skills and techniques; and the addition of advanced practice provider fellowships (with external funding)
- Three Cleveland Clinic Innovation spin-off companies

In addition, our national medical experts continue to hold leadership positions with specialty organizations, including Wilma Bergfeld, MD, Chair of the Cosmetic Ingredient Review Expert Panel (Personal Care Products Council), who presented before the U.S. Senate Committee on Health, Education, Labor and Pensions.

We welcome your feedback, questions, and ideas for collaboration. Please contact me at outcomesbooksfeedback@ccf.org and reference the Dermatology & Plastic Surgery Institute book in your message.

Frank A. Papay, MD, FACS, FAAP
Chairman, Dermatology & Plastic Surgery Institute
Professor, Cleveland Clinic Lerner College of Medicine

Institute Overview

Cleveland Clinic's Dermatology & Plastic Surgery Institute offers patients a wide array of dermatologic, reconstructive, and aesthetic services and is one of the largest such practices in the nation. The institute and its staff are dermatology and plastic surgery leaders with accomplishments in patient care, clinical research, and specialty academy leadership. Inclusive of northeast Ohio and Florida operations, the institute has 38 dermatologists who offer specialty care for adult and pediatric patients and 23 plastic surgeons with expertise in all areas of aesthetic and reconstructive plastic surgery. The Dermatology & Plastic Surgery Institute also employs 19 advanced practice providers who support the practice and physician care teams through independent patient management and assistance.

The Ohio practice consists of care at Cleveland Clinic's main campus, 9 Cleveland Clinic family health centers, and 3 regional hospitals across northeast Ohio. The institute also includes 4 dermatologists and 5 plastic surgeons who offer care at 3 Cleveland Clinic locations in southern Florida. Institute physicians provide focused specialty care clinics and also participate on numerous care teams combining the collective expertise of multiple Cleveland Clinic specialists, with clinics focused on craniofacial deformities and cleft palate, vascular malformation, wound healing, melanoma, aesthetics, and reconstructive transplant.

2016 Volumes

Institute Overview	Total
Patient Visit Volume	
Dermatology	116,559
Plastic surgery	45,117
Dermatologic Procedures and Treatments	
Mohs micrographic surgery	4519
Phototherapy/ultraviolet light treatments	8783
Facial Cosmetic Surgeries	
Facelift/necklift	122
Blepharoplasty (upper & lower)	116
Browlift	13
Primary and Secondary Rhinoplasty	
Primary	68
Secondary	22
Cosmetic Breast Surgeries	
Breast reduction	345
Breast augmentation	171
Mastopexy	189
Body Contouring	
Abdominoplasty	127
Liposuction trunk/extremities	168
Liposuction head/neck	16
Breast Reconstruction	
Reconstruction with TRAM[a] flap	7
Reconstruction with prosthesis	419
Reconstruction with latissimus dorsi flap	27
Oncoplasty	211
DIEP[b] flap	165
Endoscopic and Open Carpal Tunnel Surgery	
Endoscopic	168
Open	242

[a]TRAM = Transverse rectus abdominis myocutaneous
[b]DIEP = Deep inferior epigastric perforator

Low False Negative Rate Using Indocyanine Green Assisted Sentinel Lymph Node Biopsy in Cutaneous Melanoma

Sentinel lymph node biopsy (SLNB) has become the standard of care in the management of cutaneous melanoma, but unfortunately, the false negative rate (FNR) of SLNB remains as high as 21%.[1] The FNR is defined as the number of false negative SLNBs (metastatic nodes identified in the same nodal basin as a previous negative SLNB) divided by that number plus true positive SLNBs. Institute researchers recently demonstrated that indocyanine green (ICG) SLNB in cutaneous melanoma has a node localization rate superior to that of standard techniques,[2] but the FNR associated with this technique was yet to be determined.

To assess the FNR, the records of a single surgeon's consecutive cutaneous melanoma patients who underwent radioisotope and ICG SLNB from 2011 to 2014 were reviewed. All patients met the National Comprehensive Cancer Network criteria for SLNB and had a minimum of 24 months follow-up. Multiple predictive variables were analyzed, including SLNB location.

Demographics and Tumor Characteristics (N = 125)

2011 – 2014

	Cohort N = 125	SLN Negative N = 100	SLN Positive N = 25
Demographics			
Mean age, years (range)	59.1 (± 17.6)	58.0 (± 17.6)	63.4 (± 17.4)
Female, N (%)	60 (48.0)	53 (53.0)	12 (48.0)
Male, N (%)	65 (52.0)	47 (47.0)	13 (52.0)
Melanoma Location			
Trunk, N (%)	40 (32.0)	33 (33.0)	7 (28.0)
Upper extremity, N (%)	32 (25.6)	26 (26.0)	6 (24.0)
Head/neck, N (%)	31 (24.8)	27 (27.0)	4 (16.0)
Lower extremity, N (%)	22 (17.6)	14 (14.0)	8 (32.0)
Shave Biopsy			
Yes, N (%)	81 (64.8)	66 (66.0)	15 (60.0)
No, N (%)	44 (35.2)	34 (34.0)	10 (40.0)
Biopsy Positive Deep Margins			
Yes, N (%)	63 (50.4)	49 (49)	14 (56.0)
No, N (%)	62 (49.6)	51 (51)	11 (44.0)
Melanoma Type			
Superficial spreading, N (%)	76 (60.8)	67 (67.0)	9 (36.0)
Nodular, N (%)	28 (22.4)	16 (16.0)	12 (48.0)
Lentigo, N (%)	5 (4.0)	5 (5.0)	0 (0.0)
Spitzoid, N (%)	5 (4.0)	4 (4.0)	1 (4.0)
Nevoid, N (%)	7 (5.6)	5 (5.0)	2 (8.0)
Epithelioid, N (%)	1 (0.8)	1 (1.0)	0 (0.0)
Subungual, N (%)	1 (0.8)	1 (1.0)	0 (0.0)
Desmoplastic, N (%)	1 (0.8)	1 (1.0)	0 (0.0)
Acral lentigo, N (%)	1 (0.8)	0 (0.0)	1 (4.0)

- continued

Demographics and Tumor Characteristics (N = 125) - continued

2011 – 2014

	Cohort N = 125	SLN Negative N = 100	SLN Positive N = 25
Melanoma Stage			
pT1a, N (%)	25 (20)	24 (24.0)	1 (4.0)
pT1b, N (%)	28 (22.4)	27 (27.0)	1 (4.0)
pT2a, N (%)	29 (23.2)	23 (23.0)	6 (24.0)
pT2b, N (%)	8 (6.4)	8 (8.0)	0 (0.0)
pT2c, N (%)	2 (1.6)	2 (2.0)	0 (0.0)
pT3a, N (%)	14 (11.2)	8 (8.0)	6 (24.0)
pT3b, N (%)	10 (8.0)	4 (4.0)	6 (24.0)
pT4a, N (%)	4 (3.2)	2 (2.0)	2 (8.0)
pT4b, N (%)	5 (4.0)	2 (2.0)	3 (12.0)
N/A, N (%)	0 (0.0)	0 (0.0)	0 (0.0)
Mean Breslow Thickness, mm (SD)	1.6 (± 1.3)	1.3 (± 1.1)	2.8 (± 1.5)
Mitotic Index			
Present, N (%)	87 (69.6)	66 (66.0)	21 (84.0)
Absent, N (%)	38 (30.4)	34 (34.0)	4 (16.0)
Regression			
Present, N (%)	16 (12.8)	15 (15.0)	1 (4.0)
Absent, N (%)	102 (81.6)	80 (80.0)	22 (88.0)
Unknown, N (%)	7 (5.6)	5 (5.0)	2 (8.0)
Ulceration			
Present, N (%)	31 (24.8)	20 (20)	11 (44)
Absent, N (%)	91 (72.8)	77 (77)	14 (56)
Unknown, N (%)	3 (2.4)	3 (3)	0 (0)

SLN = sentinel lymph node

Sentinel Lymph Node Biopsy Characteristics (N = 125)

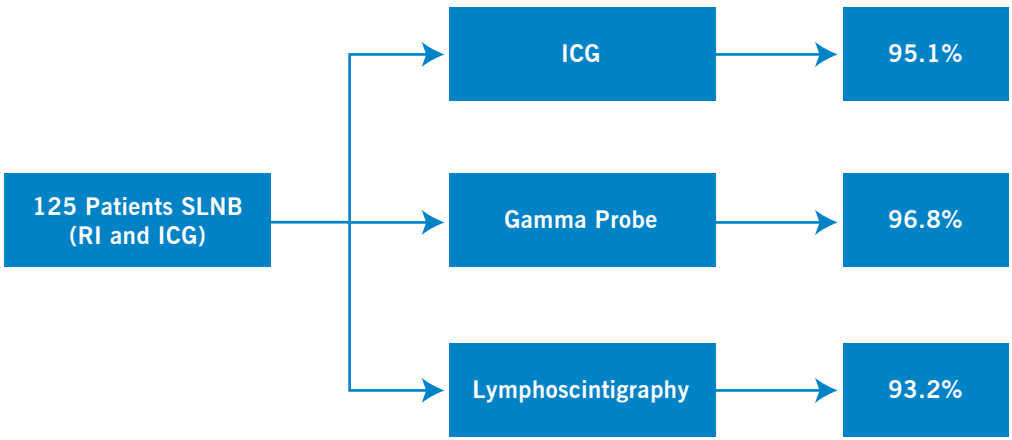
2011 – 2014

	Cohort N = 125	SLN Negative N = 100	SLN Positive N = 25
Sentinel Lymph Node Biopsy Location			
Axilla, N (%)	60 (48.0)	48 (48.0)	12 (48.0)
Groin, N (%)	25 (20.0)	18 (18.0)	7 (28.0)
Axilla and supraclavicular, N (%)	5 (4.0)	4 (4.0)	1 (4.0)
Cervical, N (%)	13 (10.4)	13 (13.0)	0 (0.0)
Supraclavicular, N (%)	3 (2.4)	2 (2.0)	1 (4.0)
Parotid, N (%)	9 (7.2)	5 (5.0)	4 (16.0)
Posterior auricular, N (%)	3 (2.4)	3 (3.0)	0 (0.0)
Submandibular, N (%)	3 (2.4)	3 (3.0)	0 (0.0)
Suboccipital, N (%)	2 (1.6)	2 (2.0)	0 (0.0)
Parotid and cervical, N (%)	2 (1.6)	2 (2.0)	0 (0.0)
Nodes Sampled, mean (SD)	3.0 (± 2.7)	2.6 (± 2.4)	2.0 (± 1.6)
Laterality of Nodes			
Right, N (%)	62 (49.6)	50 (50.0)	12 (48.0)
Left, N (%)	52 (41.6)	40 (40.0)	12 (48.0)
Bilateral, N (%)	11 (8.8)	10 (10.0)	1 (4.0)

SLN = sentinel lymph node

Nodal Localization Rate of Indocyanine Green, Gamma Probe, and Lymphoscintigraphy (N = 125)

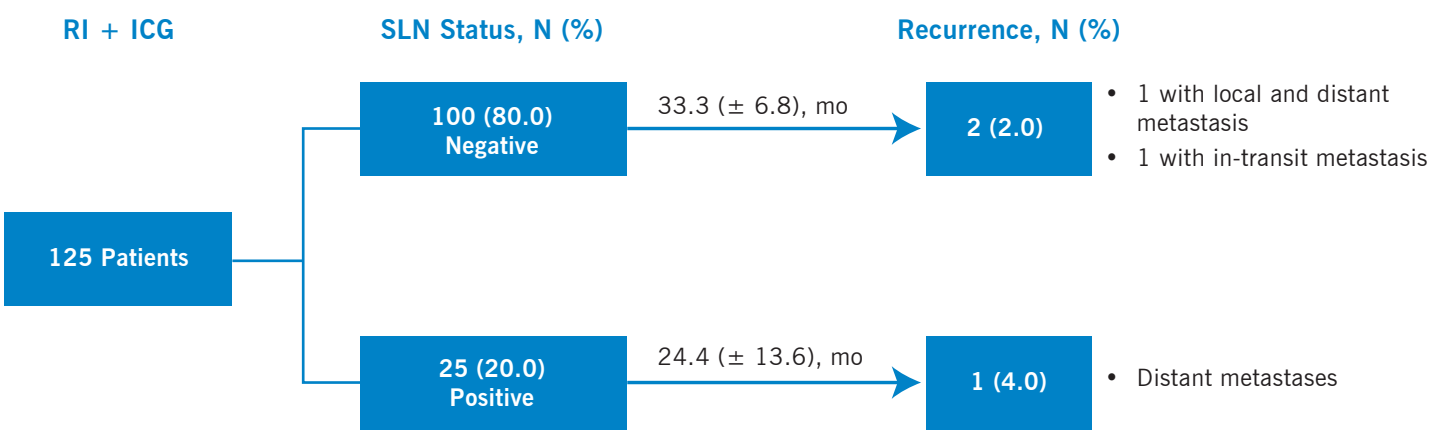
2011 – 2014



ICG = indocyanine green, RI = radioisotope (technetium-99 sulfur colloid), SLNB = sentinel lymph node biopsy

Malignancy Recurrence in Cohort (N = 125)

2011 – 2014



ICG = indocyanine green, RI = radioisotope (technetium-99 sulfur colloid), SLN = sentinel lymph node

There were 2 cases of false negative SLNB, one of which was an in-transit metastasis. Therefore, the false negative rate and adjusted false negative rate (removing the case with additional disease) were 7.4% and 3.7%, respectively. Furthermore, the negative predictive value was 98% and the adjusted negative predictive value was 99%.

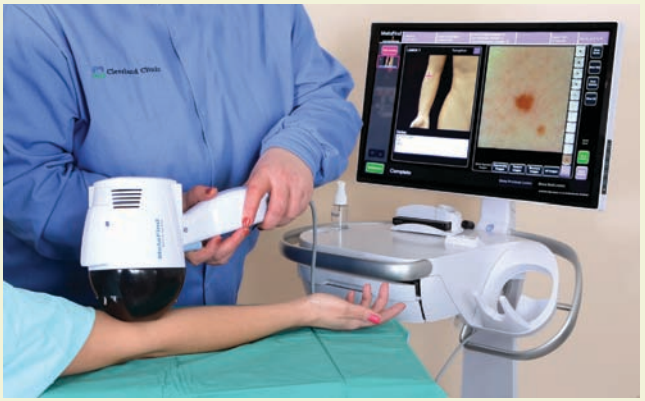
In this study, ICG-assisted SLNB exhibited one of the lowest FNRs ever reported despite the high percentage of patients with head and neck melanoma (known to have higher recurrence), with a high negative predictive value; thus, it is an effective and reliable technique in the management of patients with cutaneous melanoma.

References

1. Cascinelli N, Bombardieri E, Bufalino R, Camerini T, Carbone A, Clemente C, Lenisa L, Mascheroni L, Maurichi A, Pennacchioli E, Patuzzo R, Santinami M, Tragni G. Sentinel and nonsentinel node status in stage IB and II melanoma patients: two-step prognostic indicators of survival. *J Clin Oncol*. 2006 Sep 20;24(27):4464-4471.
2. Korn JM, Tellez-Diaz A, Bartz-Kurycki M, Gastman B. Indocyanine green SPY Elite-assisted sentinel lymph node biopsy in cutaneous melanoma. *Plast Reconstr Surg*. 2014 Apr;133(4):914-922.

Noninvasive Analysis of Pigmented Lesions

In 2013, the Department of Dermatology initiated use of the MelaFind® device to analyze clinically and dermatoscopically ambiguous pigmented lesions. The multispectral optical handpiece emits 10 spectral light bands (430–950 nm) penetrating to a depth of 2 mm below the skin surface. Light patterns reflected to the handpiece are analyzed for atypia and malignancy (in situ to mature), and lesions are ranked on a low to high disorganization scale. Literature reports indicate that MelaFind analysis approaches a sensitivity > 98%; the risk of missing an atypical or malignant lesion is extremely low.



MelaFind pigmented lesion evaluation

Patients with a personal or family history of atypical/dysplastic nevi, malignant melanoma, or melanoma in situ undergo an initial total body skin examination and dermoscopy. Clinically and dermatoscopically banal lesions are not candidates for MelaFind analysis, and those grossly suspicious for atypia or frank malignancy are biopsied directly. MelaFind is used on all ambiguous lesions, and lesions identified as high-risk are biopsied.

MelaFind Lesion Analysis and Results

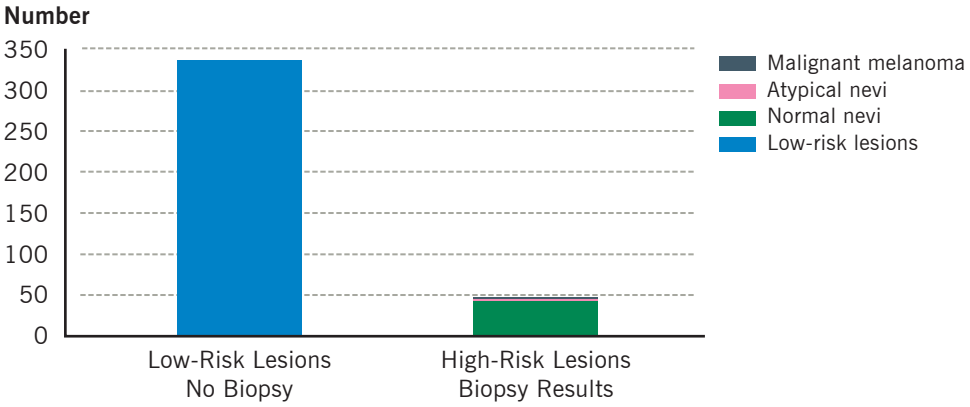
2016

	N (%)
Patients evaluated[a]	170
Ambiguous lesions detected	380
Low-risk lesions	334 (87)
High-risk lesions biopsied	46 (13)
Biopsy Results	
Normal nevi	43 (93)
Atypical nevi	2 (4)
Melanomas	1 (2)

[a]Includes all patients entering the MelaFind program since 2013 who have undergone repeated screenings and had at least one screening in 2016.

Ambiguous Lesion Analysis Results (N = 380)

2016



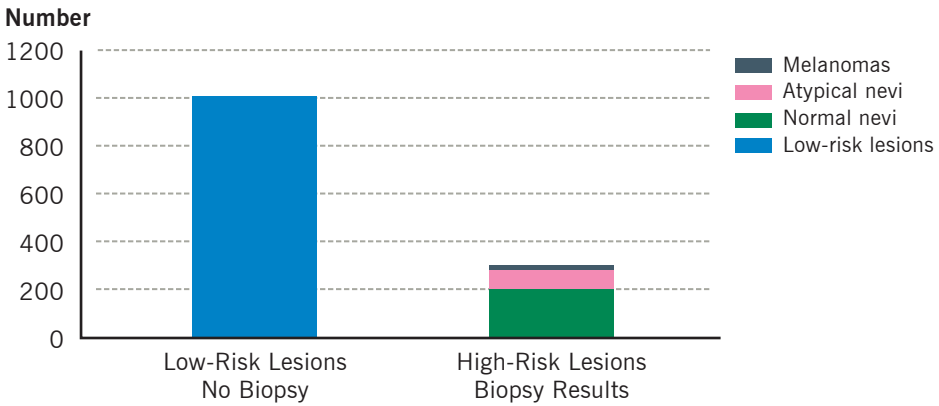
Cumulative MelaFind Program Lesion Analysis and Results

2013 – 2016

	N (%)
Patients evaluated	170
Ambiguous lesions detected	1303
Low-risk lesions	1004 (77)
High-risk lesions biopsied	299 (23)
Biopsy Results	
Normal nevi	202 (68)
Atypical nevi	84 (28)
Melanomas	13 (4)

Cumulative Ambiguous Lesion Analysis Results (N = 1303)

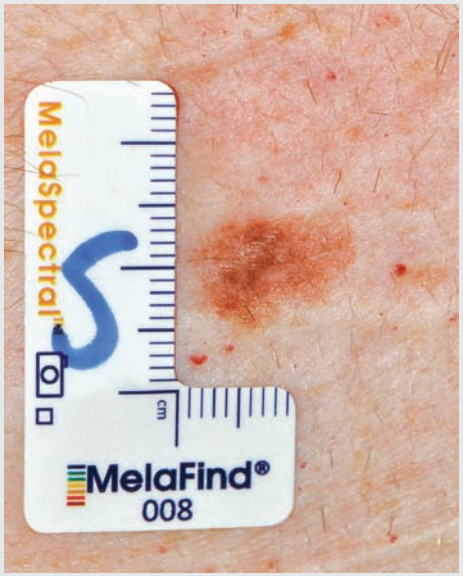
2013 – 2016



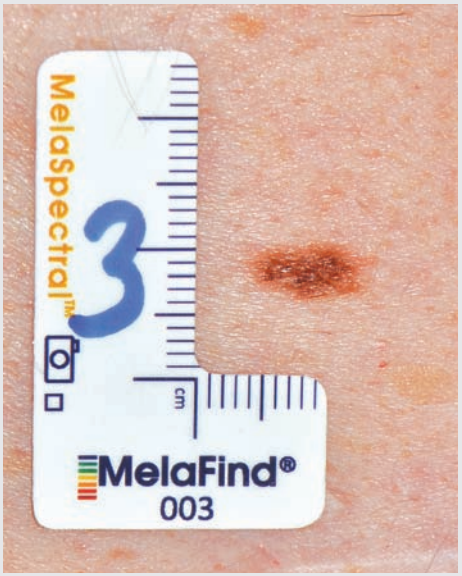
Melanoma

Before initiation of MelaFind analysis, the institute would have performed biopsies on all 1303 ambiguous lesions identified with dermoscopy from 2013 to 2016. MelaFind analysis resulted in 77% fewer biopsies. Furthermore, of those ambiguous lesions classified as high risk by MelaFind and subsequently biopsied, only 33% were atypical nevi or malignant melanoma, representing only 7.5% of all ambiguous lesions.

Further analysis of the subset of lesions graded as high risk by MelaFind but found to be benign on pathologic analysis is being pursued. Early findings suggest that the presence of inflammation and/or melanoderma contiguous to the pigmented lesion or excessive keratinization of the lesion may yield a false high-risk score. Incorporating this finding into the MelaFind algorithm in the future may increase the specificity of the results while retaining the extremely high sensitivity of this analytic tool.



Early malignant melanoma detected by MelaFind analysis

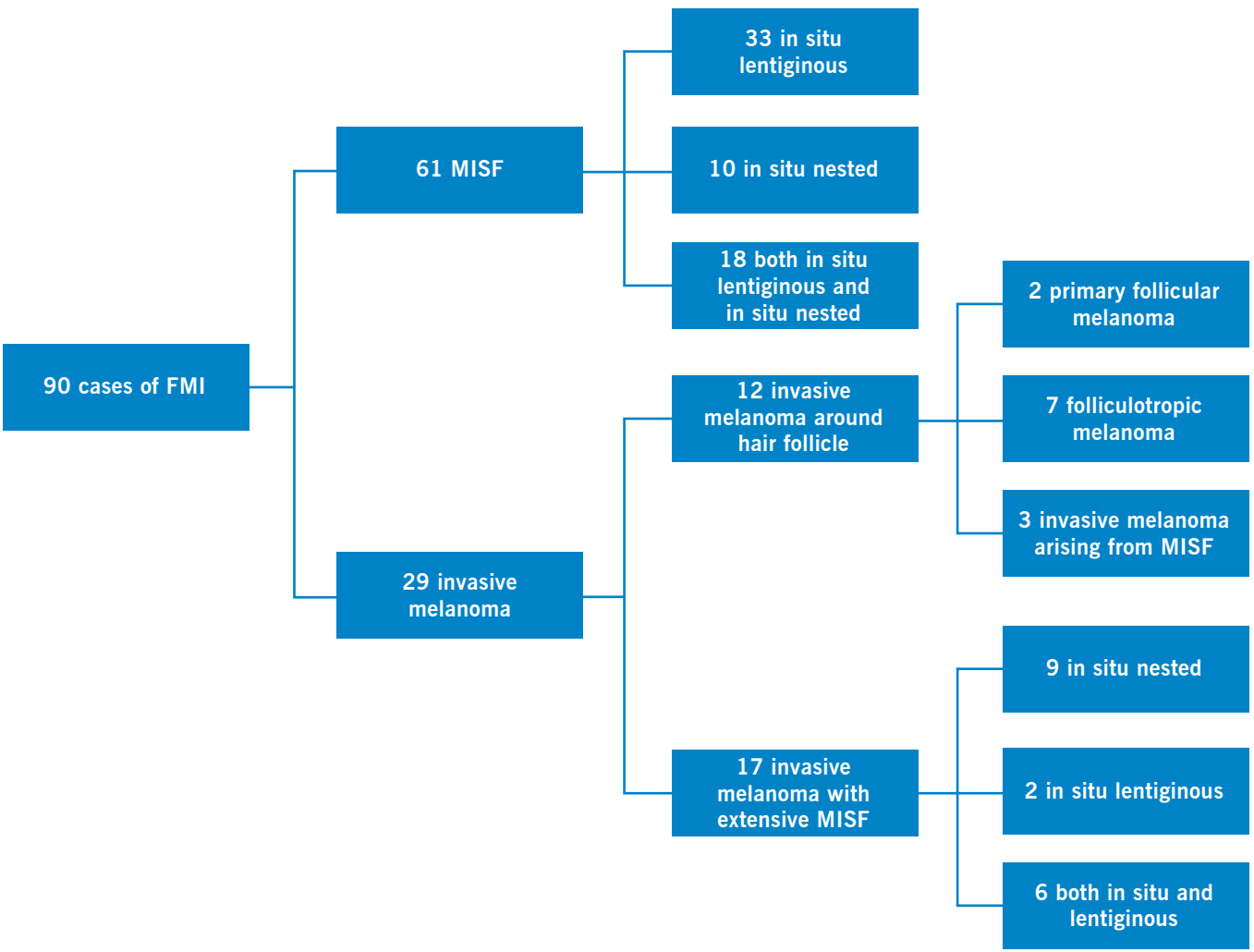


Atypical nevus detected by MelaFind analysis

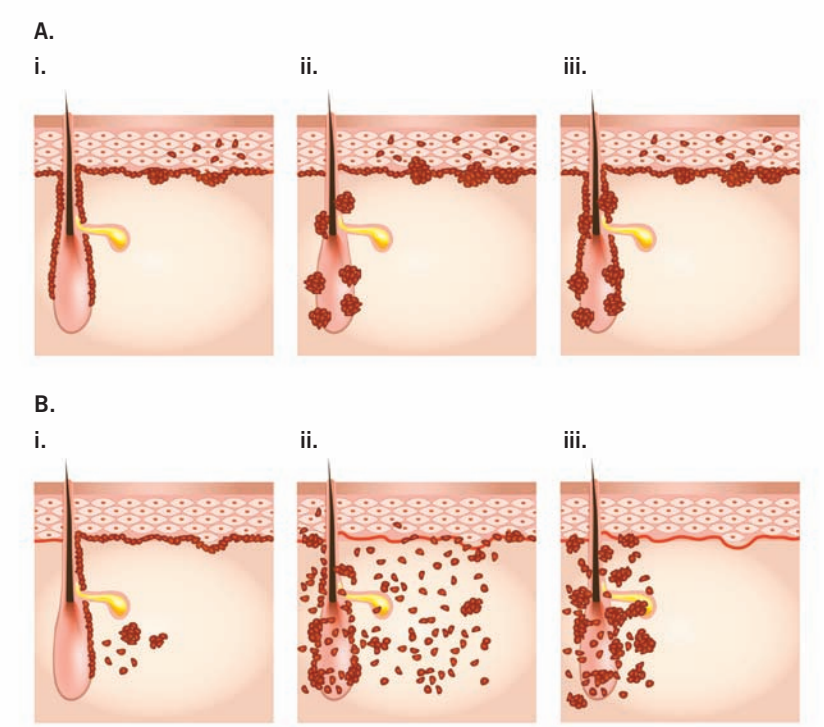
A Proposed Classification for Follicular Melanoma[1]

Institute researchers retrospectively reviewed 90 cases of melanoma with involvement of the hair follicle and identified 3 distinct patterns of invasive melanoma and 3 distinct patterns of melanoma in situ (MIS). Identification of these patterns is potentially valuable for logically categorizing cases of follicular melanoma. The institute has developed a checklist as a useful tool to categorize follicular melanoma cases.

All Observed Patterns of Hair Follicle Involvement by Melanoma and Melanoma in Situ (N = 90)



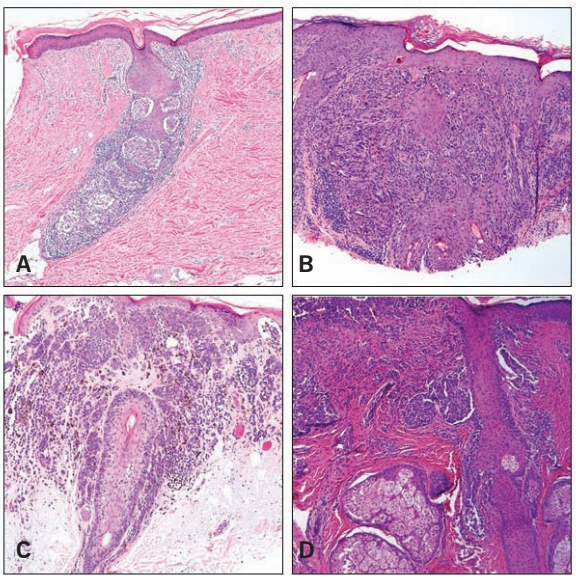
FMI = follicular melanomatous invasion, MISF = melanoma in situ with follicular involvement



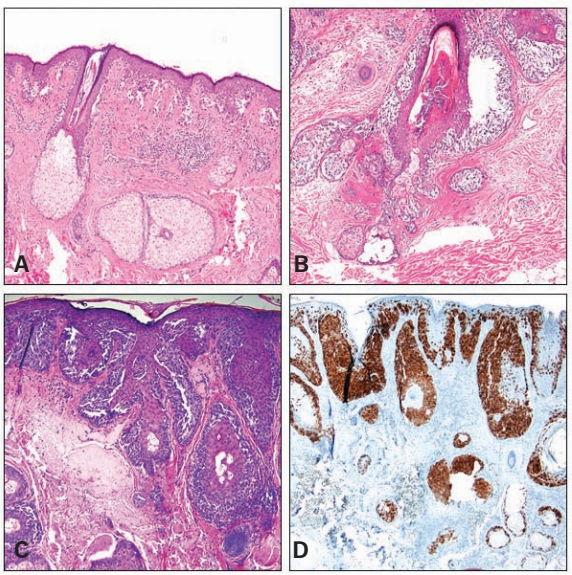
A. Patterns of involvement of the hair follicle by MIS: lentiginous (i), nested (ii), lentiginous and nested (iii).

B. Patterns of follicular involvement by invasive melanoma: melanoma arising from MIS with extensive follicular involvement (i), folliculotropic (ii), primary follicular melanoma (iii).

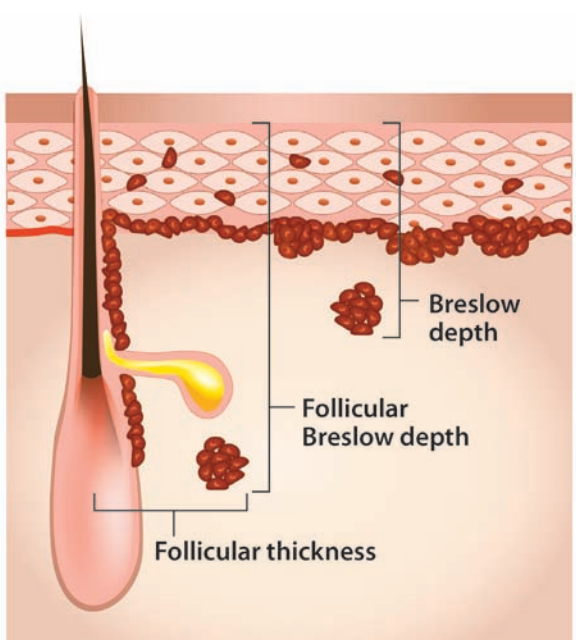
The invasive patterns were primary follicular, folliculotropic, and invasive arising from MIS with extensive follicular involvement. Follicular involvement by MIS was either lentiginous, nested, or a combination of both.



Patterns of hair follicle involvement by invasive melanoma include primary follicular (A, B), folliculotropic (C), and invasive melanoma arising from MIS (D).



Patterns of hair follicle involvement by MIS include lentiginous (A), nested (B), and a combination of lentiginous and nested patterns (C). Melan-A staining highlights the nested and lentiginous growth of melanocytes extending beyond the hair follicle isthmus (D).



Suggested terminology for measuring melanomas with significant follicular involvement

Proposed Checklist for Follicular Melanoma

Involvement of the hair follicle (select all that apply)

____ Invasive melanoma

- ____ Primary follicular melanoma
- ____ Melanoma with folliculotropism
- ____ Melanoma arising from melanoma in situ with extensive follicular involvement

____ Melanoma in situ

- ____ Lentiginous
- ____ Nested
- ____ Both lentiginous and nested

____ Anatomic depth of hair follicle involvement

- ____ Infundibulum
- ____ Isthmus
- ____ Bulb

____ Breslow depth/thickness (granular layer to deepest invasive melanocyte NOT involving the hair follicle OR center of the hair follicle to nearest invasive melanoma)

____ Follicular Breslow depth (granular cell layer to deepest atypical melanocyte in/around follicular structure)[a]

[a]Follicular Breslow depth does not represent true tumor thickness (eg, Breslow depth). The measurement is only given to demonstrate depth of extensive follicular involvement.

Reference

1. Tjarks BJ, Somani N, Piliang M, Bergfeld, WF. A proposed classification for follicular involvement by melanoma. *J Cutan Pathol*. 2017 Jan;44(1):45-52.

National Quality Measures for Cutaneous Malignant Melanoma Staging

In 2009, the American Joint Committee on Cancer defined and described pathologic characteristics that can enhance the accuracy of primary cutaneous melanoma tumor staging.[1] The recommendations include adding mitotic rate (stage pT1 and higher) and ulceration characteristics, in addition to tumor thickness, to pathology reports. The institute's Dermatopathology Section has reported the quality measures for all primary malignant melanoma specimens processed at Cleveland Clinic's main campus since 2012. Compliance has been at 100% since 2014. The quality measures for 2016 are reported below.

Primary Malignant Melanoma Pathology Reports Meeting AJCC Criteria (N = 102)

2016

Parameter	Number	Percent
Report lists pT category	102	100
Tumors staged pT1	91	-
pT1 report lists mitotic rate	91	100
Report includes a statement on thickness	102	100
Report includes information on ulceration	102	100

AJCC = American Joint Committee on Cancer, pT = primary tumor, pT1 = primary tumor thickness ≤ 1

Reference

1. Balch CM, Gershenwald JE, Soong SJ, et al. Final version of 2009 AJCC melanoma staging and classification. *J Clin Oncol*. 2009 Dec 20;27(36):6199-6206.

Vapocoolant Sprays Offer Significant Pain Reduction[1]

Vapocoolant sprays (skin refrigerants) are topical anesthetics known to efficiently reduce injection pain during botulinum toxin administration, filler treatments, subcutaneous injections, shave biopsies, curettage, and incisional biopsies.[2, 3] This study investigated the pain reduction efficacy of a skin refrigerant during acrochordon removal in the office setting.

A total of 34 healthy patients with bilateral acrochordons were enrolled to assess differences in pain level between skin refrigerant spray and placebo spray. Only patients with mirror-image lesions were included in this study. Patients were randomized and blinded to the type of spray they were receiving. After each excision, they were asked to grade the pain level using a validated 10-point Likert pain scale.

Mean patient age was 60 ± 13 years; 14 (41.2%) were male and 20 (58.8%) were female. The mean pain score for the vapocoolant group was 1.4 points (95% CI -2.2 to -0.7) lower than for the placebo group, and the difference was significant ($P = 0.001$).

Vapocoolant sprays are drug free; maintain sterility; have ease of administration, rapid anesthesia onset, and low cost; and are an excellent option for minor surgical procedures in the office setting.

Associations With Pain Difference

January 2015 – August 2016

Factor	N	Mean Pain Score (CI)	*P* Value
Gender			0.14
Male	14	-1.0 (-1.0-0.0)	
Female	20	-2.0 (-3.0-0.0)	
Ethnicity			0.96
Nonwhite	5	-2.0 (-2.0 to -0.5)	
White	29	-1.0 (-2.0-0.0)	
Vapocoolant: Side			0.24
Left	15	-1.0 (-2.0-1.0)	
Right	19	-1.0 (-3.0 to -0.5)	
Location			0.88
Axilla	10	-1.00 (-2.0 to -0.50)	
Neck	14	-1.5 (-3.0-0.0)	
Other	10	-1.00 (-2.0-0.0)	

References

1. Mlynek K, Duraes EFR, Kortyka S, Moore F, Zins JE. A prospective, blinded placebo-controlled evaluation of pain control using a vapocoolant spray during minor office procedures. *Practical Dermatology*. March 2017. practicaldermatology.com/pdfs/pd0317_ResidentsResourceCt.pdf
2. Engel SJ, Afifi AM, Zins JE. Botulinum toxin injection pain relief using a topical anesthetic skin refrigerant. *J Plast Reconstr Aesthet Surg*. 2010 Sep;63(9):1443-1446.
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Smartphone Cosmetic Surgery Follow-Up

The institute conducted a study using a smartphone-based postoperative protocol initially established as a quality improvement project for cosmetic procedure patients, to determine the efficacy of and impact on patient experience of this early follow-up. Between August 2015 and March 2016, 57 patients received a text upon discharge with instructions to take and forward a photograph of the operated area within 48–72 hours for review by the plastic surgeon. Also, they were encouraged to send additional pictures whenever they had any concerns with the postoperative course. Patients who sent a photograph received a same-day call from the surgeon to review their progress followed by a questionnaire about the smartphone follow-up program and their postoperative experience.

Cohort Characteristics (N = 57)

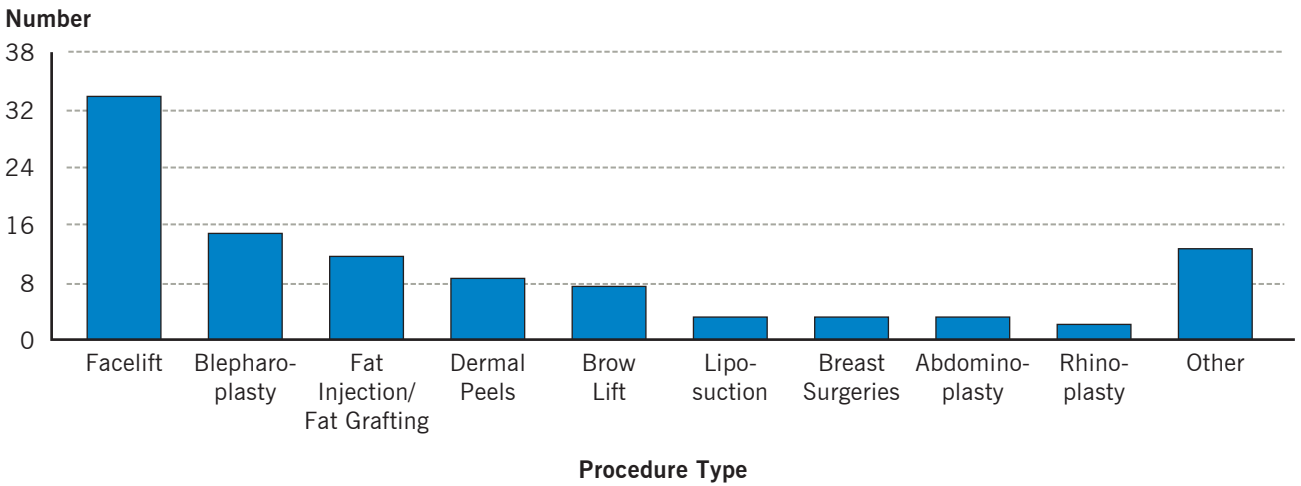
August 2015 – March 2016

	Male	Female	Total
N	7	50	57
Age, years (range)	65.1 ± 3.4 (60 – 70)	58.8 ± 9.6 (30 – 73)	59.6 ± 9.3 (30 – 73)
BMI, kg/m^2 (range)	25.4 ± 2.5 (22.8 – 30.8)	23.3 ± 4.1 (16.8 – 39.5)	23.6 ± 4.0 (16.8 – 39.5)
Prior plastic procedures, N (%)	4 (57.1)	37 (74)	41 (82)
Comorbidities, N (%)	7 (100)	45 (90)	52 (91.2)

BMI = body mass index

Cosmetic Procedures Performed (N = 95[a])

August 2015 – March 2015



[a]Some patients had more than one procedure

Of the 57 patients, 52 sent photographs after their cosmetic procedure and completed the questionnaire. Of these, a total of 50 (96.2%) patients reported that the process improved the quality of their postoperative experience.

The protocol allowed early detection of complications in 3 cases. In each case, the surgeon was able to address and treat the complications the day following receipt of the photograph and prior to the originally scheduled clinic follow-up. The study shows that smartphone technology and related photographic capabilities can be effectively used to both enhance patients' postoperative experience and alert the surgeon to early postoperative problems.

Complications Detected With Smartphone Follow-Up (N = 3)

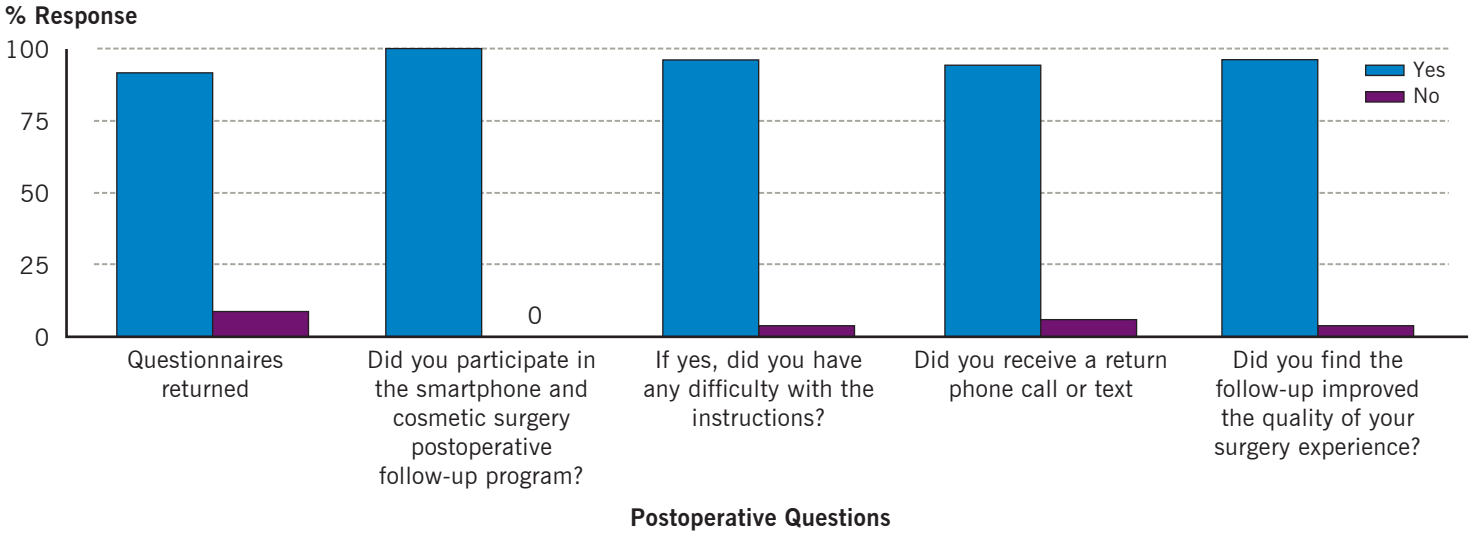
August 2015 – March 2016

Initial cosmetic procedure	Abdominoplasty	Facelift; Dermal Peel	Browlift; Dermal Peel
Age	53	59	73
Sex	F	F	F
BMI, kg/m^2	21.8	21.1	25.7
Comorbidities	Minor depression	Hypertension	Heart disease
Complication	Infection	Seroma, infection	Infection
Days from surgery to photograph detecting complication	7	7	11
Days from photograph detecting complication to office follow-up	1	1	1
Symptoms	Redness, erythema, lower abdominal discomfort	Purulent discharge	Erythema of incision and forehead area, large amount of purulent drainage, wound breakdown in 2 areas not along incision
Treatment	Levofloxacin 750 mg	0.25 cc seropurulent fluid aspirated	Wound incision and drainage, washout

BMI = body mass index

Smartphone Follow-Up Questionnaire Results (N = 52)

August 2015 – March 2015



Postoperative Pain Control in Breast Reconstruction Patients

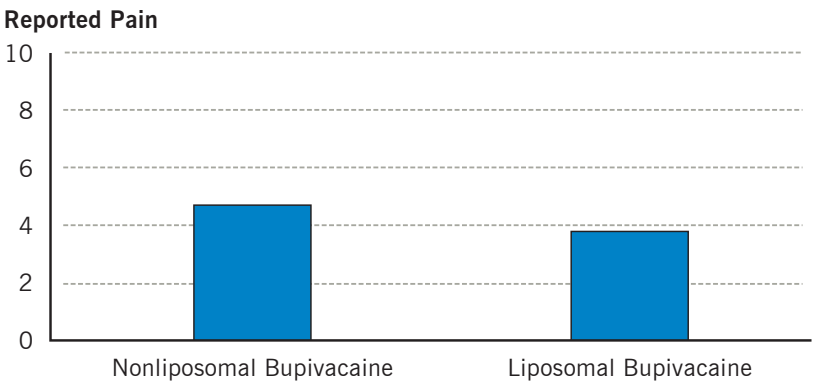
Institute surgeons compared the efficacy of perioperative surgical field infiltration of liposomal bupivacaine with the current standard treatment, nonliposomal bupivacaine HCl in patients undergoing implant-based breast reconstruction. Rescue opioid use during hospitalization and postoperative days 1–4, pain intensity and interference in daily activities measured with a 10-point scale, percentage of pain control with rescue medication, and patient satisfaction with analgesia on a 5-point categorical scale were analyzed.

From 2014 to 2017, patients undergoing immediate breast reconstruction with expanders were randomly assigned to receive liposomal bupivacaine (N = 28) 233 mg/20 mL diluted in 10 mL of 0.9% saline solution, or 30 mL of nonliposomal bupivacaine (N = 24) 0.5% with epinephrine in a perioperative field block infiltration. The infiltration was done after mastectomy with patients under general anesthesia. Four patients were excluded from the analysis due to postoperative complications.

On the first postoperative day, the amount of rescue opioid medication used did not differ between groups. Average pain reported by the liposomal bupivacaine group on the first day was lower than that reported by the nonliposomal group ($P = 0.048$).

Average Pain Reported on the First Postoperative Day (N = 48)

2014 – 2017



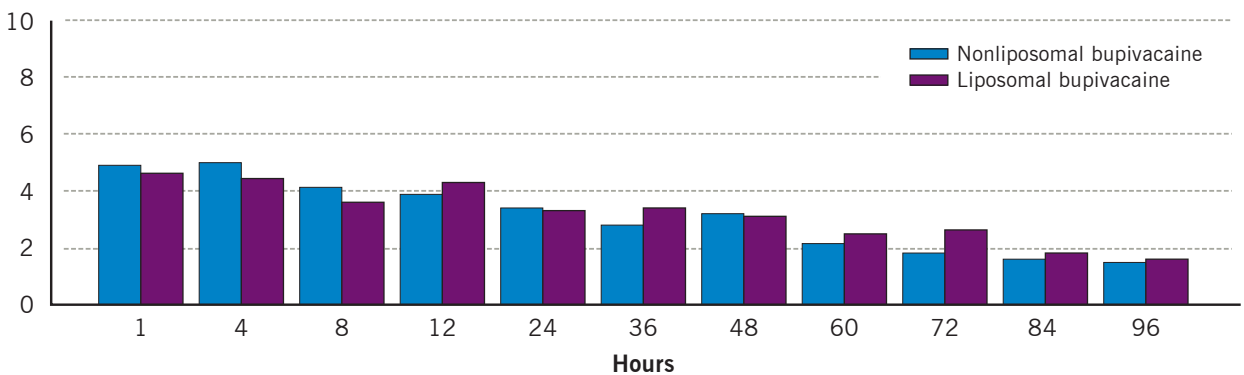
Although breast reconstruction patients reported lower average pain during the first postoperative day with liposomal bupivacaine field block infiltration, rescue medication use was significantly higher on days 3 and 4 compared with the nonliposomal group.

Opioid use did not significantly differ ($P = 0.11$) between groups on day 2, however, the liposomal group required more rescue pain medication during days 3 and 4 (72 h, $P = 0.03$; 84 h, $P < 0.01$; 96 h, $P = 0.03$). Satisfaction with analgesia was similar between groups, as was impact of pain on walking ability, mood, general activity, relation with other people, and life enjoyment.

Based on this pilot study, longer term pain control with liposomal bupivacaine was not achieved as was anticipated. Additional studies are ongoing.

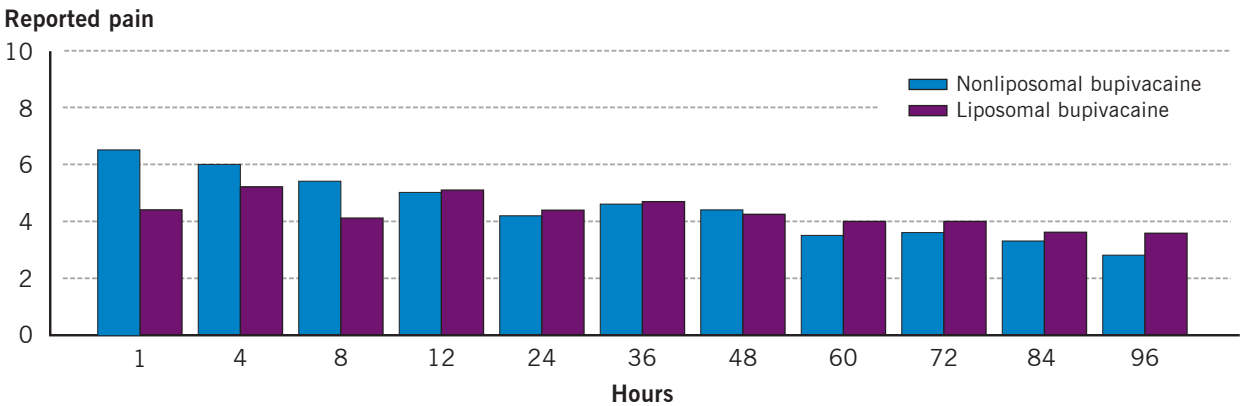
Pain Level at Rest (N = 48)

2014 – 2017



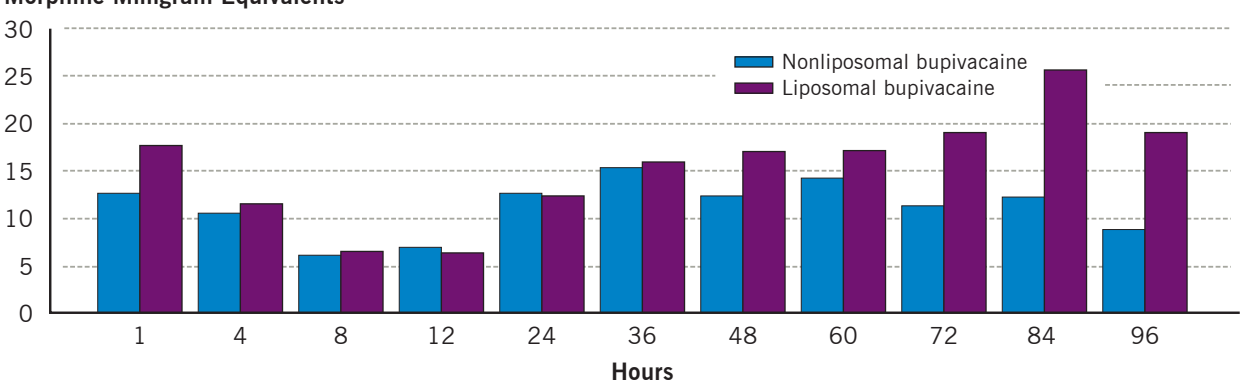
Pain Level With Activity (N = 48)

2014 – 2017



Postoperative Morphine Opioid Equivalent (N = 48)

2014 – 2017



Comparison of Local Anesthetics for DIEP Reconstruction With the Transverse Abdominis Plane Block

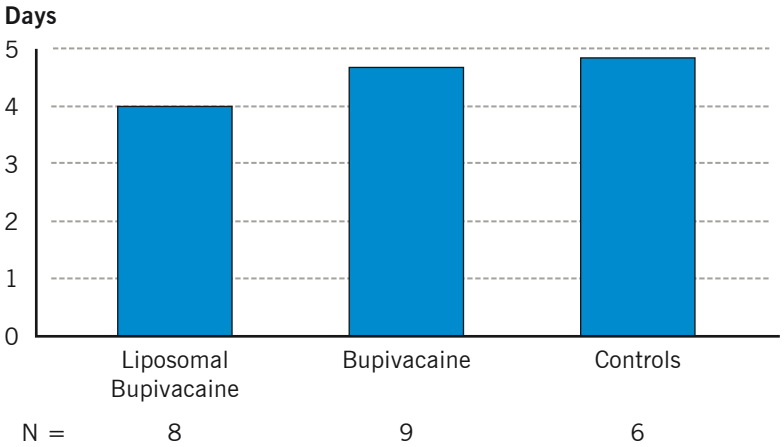
Abdominal tissue breast reconstruction has become the preferred technique in many cases. However, patients may have significant pain at the abdominal donor site following this procedure. Improved pain control following deep inferior epigastric perforator (DIEP) flap reconstruction could potentially lead to decreased narcotic use and its associated adverse effects, shorter hospital stays, and decreased medication and institutional costs. It may also improve the patient's overall hospital stay and emotional well-being.

The transversus abdominis plane (TAP) block uses a local anesthetic to block the nerves supplying sensation to abdominal wall tissues. Bupivacaine is the most commonly used anesthetic and can be injected plain or as a newer liposomal formula with controlled release that is supposed to last 3 to 4 days. It is not currently known which of these delivery methods provides the best pain relief, and the institute is conducting a study to determine whether one is superior to the other.

Since 2016, 17 patients who have undergone delayed abdominal reconstruction have been enrolled in the study, with 8 receiving liposomal bupivacaine and 9 receiving plain bupivacaine. A retrospective control group of 6 patients undergoing DIEP reconstruction in 2015 without TAP blocks was included for comparison. Patients who received the liposomal formula had a shorter average length of stay.

Length of Stay (N = 17)

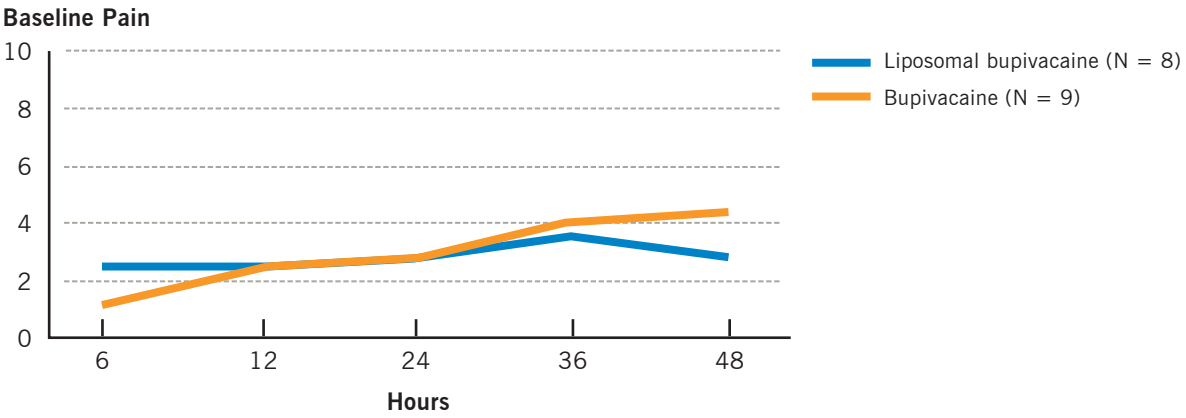
2016 – 2017



After the first 24 postoperative hours, the liposomal bupivacaine patients demonstrated significantly better baseline pain control and pain control during coughing — which facilitated earlier discharge — an abdominal site specific measure.

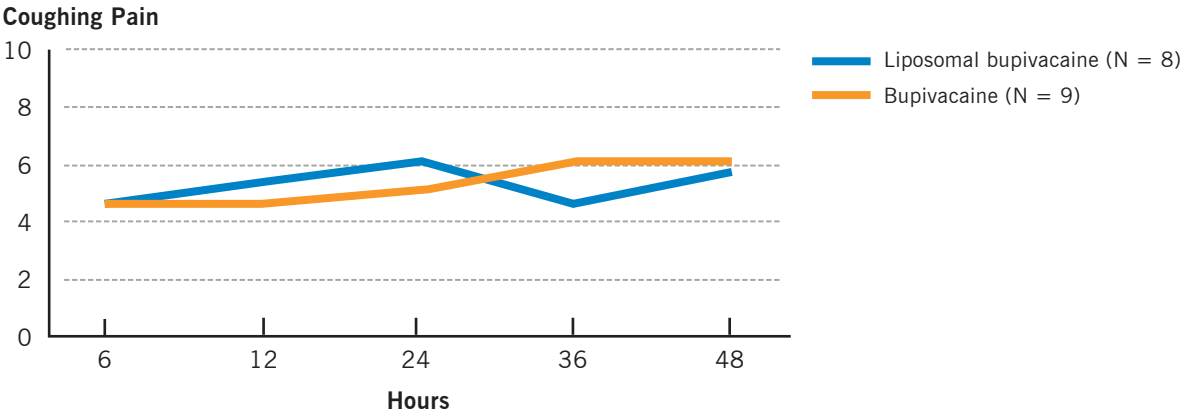
Visual Analog Scale Pain Scores at Baseline (N = 17)

2016 – 2017



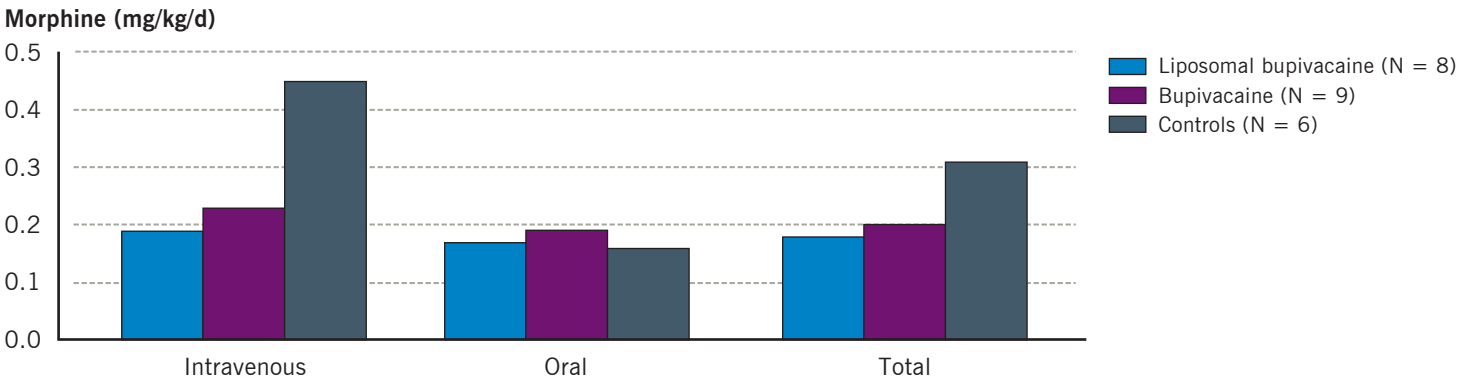
Visual Analog Scale Pain Scores When Coughing (N = 17)

2016 – 2017



Oral, intravenous, and total narcotic usage (measured in mg/kg/day) was significantly less for the group receiving liposomal compared with plain bupivacaine.

Narcotic Usage (N = 17)
2016 – 2017



These preliminary results suggest decreased hospital stays, improved pain control, and decreased narcotic use after TAP block injection using the liposomal formula. More patients are being enrolled and, meanwhile, institute surgeons have adopted the TAP block as standard practice.

Applying the BRA Score Risk Calculator to Predict Breast Reconstruction Surgical Complications

Multiple comorbidities are associated with increased breast reconstruction complications. However, defining high-risk patients and whether their reconstruction plans should differ from those for lower-risk patients remains an issue. The Breast Reconstruction Risk Assessment Score (BRA Score)[1] is an online tool proposed for calculating the preoperative risk of different breast reconstruction techniques.[2,3] The BRA Score risk algorithm is based on 3 different national surgical databases.

Institute researchers aimed to validate the BRA Score as a preoperative risk calculator for practical use and conducted a chart review of 255 patients who underwent 389 breast reconstructions of various types from 2009 to 2011. Preoperative risk for overall complications, surgical site infection (SSI), and 30-day reoperation for each reconstruction was retrospectively calculated using the BRA Score. Data from patient charts was gathered to document the actual incidences of overall postoperative complications, SSI, and 30-day reoperation. Reconstructions that developed the complication predicted by the BRA Score were compared with those that did not.

Reconstructed breasts that actually developed an overall complication or required a 30-day reoperation had a significantly higher preoperative BRA Score for those risks compared with reconstructions that did not develop them. The preoperative BRA Score SSI risk was similar for those who developed an SSI and those who did not.

BRA Score Risk Prediction Accuracy (N = 389)
2009 – 2011

Type of Complication	BRA Score Risk Assessment Used	Developed Complication (BRA Score ± SD)	Did Not Develop Complication (BRA Score ± SD)	*P* Value
Overall complication	Risk-MROC	20.8 ± 11.12	15.24 ± 9.16	$P \leq 0.01$
	Risk-TOPS	19.7 ± 7.28	15.5 ± 6.56	$P \leq 0.01$
30-Day reoperation	Reop-Risk[a]	7.48 ± 3.27	6.22 ± 5.22	$P \leq 0.01$
Surgical site infection	SSI-Risk[b]	3.75 ± 2.3	3.94 ± 2.38	$P = 0.96$

MROC = Mastectomy Reconstruction Outcomes Consortium, TOPS = Tracking Operations and Outcomes for Plastic Surgeons, SSI = surgical site infection

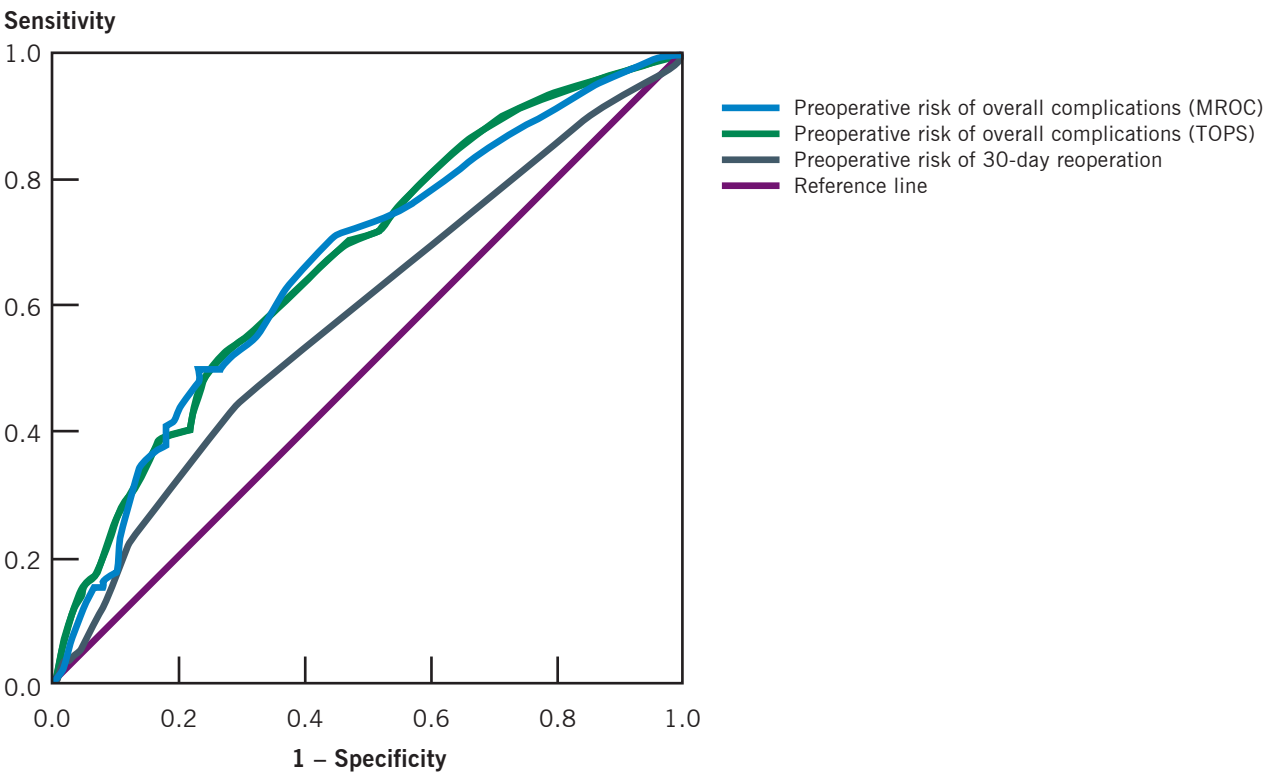
[a]Based on the Tracking Operations and Outcomes for Plastic Surgeons database

[b]Based on National Surgical Quality Improvement Program data

BRA Score tests for predicting overall complications were adequate, with areas under the curve of 0.662 and 0.669. For predicting 30-day reoperations, BRA Score tests presented areas under the curve of 0.666, 0.691, and 0.652.

Evaluation of BRA Score Tests to Predict Overall Postoperative Complications (N = 389)

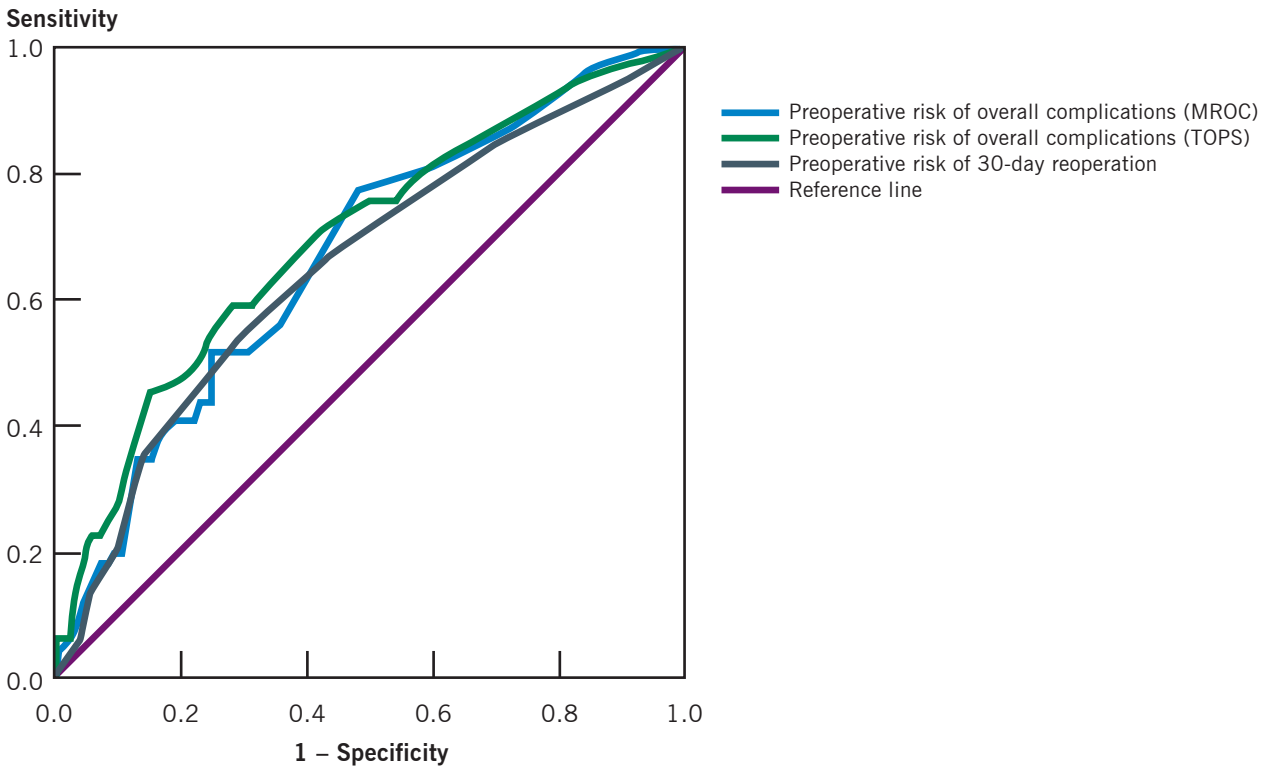
2009 – 2011



MROC = Mastectomy Reconstruction Outcomes Consortium, TOPS = Tracking Operations and Outcomes for Plastic Surgeons

Evaluation of BRA Score Tests to Predict 30-Day Reoperations (N = 389)

2009 – 2011



MROC = Mastectomy Reconstruction Outcomes Consortium, TOPS = Tracking Operations and Outcomes for Plastic Surgeons

The BRA Score was a helpful tool in predicting overall complications and reoperations. The calculator was not found to be useful in predicting surgical site infection. Because patients with high preoperative risk may benefit from modifications in the breast reconstruction treatment plan to lower the complication rate, the BRA Score can reliably be used to predict possible reconstruction outcomes and to better counsel the patient.

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Patient Reported Quality of Life After Complex Abdominal Wall Reconstruction

Patient reported outcomes were analyzed using a validated hernia-related quality of life survey (HerQLes)[1] to assess abdominal wall function after complex abdominal wall reconstruction (AWR) using mesh or biologics with microsurgical flaps in 10 consecutive patients treated at Cleveland Clinic between 2014 and 2016. The HerQLes survey contains 12 questions on various aspects of daily living such as heavy lifting, walking, climbing stairs, dressing, showering, sexual activity, and physical pain. Baseline values were compared with those obtained at a minimum of 6 months after complex AWR. The HerQLes scores demonstrated patient-centered functional improvements after complex AWR using mesh or biologics along with microsurgical flaps.

Patient, Hernia, and Repair Characteristics (N = 10)

2014 – 2016

Patients (N = 10)	1	2	3	4	5	6	7	8	9	10
Age, y	68	69	78	34	47	45	49	56	52	66
Sex	F	M	M	M	F	M	M	M	M	F
ASA class	3	3	3	2	3	3	3	3	3	3
Body mass index	32.6	31.2	32.2	26.7	36.7	28.0	30.2	24.3	31.6	36.1
Smoker	+	+	+	+	–	–	–	+	+	–
Diabetes mellitus	–	–	+	–	–	–	+	+	–	–
HTN	–	–	+	–	–	–	+	+	–	–
COPD	–	–	–	–	–	–	–	–	–	–
Radiation history	+	–	–	–	–	–	–	–	–	–
Previous hernia repair(s)	30	14	10	1	10	–	–	–	8	4
Previous mesh infection	+	–	+	–	+	–	–	–	+	+
Skin defect area, cm	30 x 25	30 x 20	30 x 30	20 x 25	12 x 25	18 x 30	15 x 30	15 x 25	25 x 30	15 x 25
Hernia grade	3	3	3	3	2	2	2	2	2	2
Existing fistula	–	–	–	–	–	+	–	–	–	–
Exposed mesh	–	–	–	–	+	–	–	–	–	+
Presence of contamination	+	–	–	–	+	+	–	–	–	+
Simultaneous bowel surgery	–	–	–	–	–	+	–	–	–	–
Parastomal hernia/colostomy	+	–	–	–	–	–	–	–	–	–
Synthetic mesh	Bard® Soft Mesh	Bard	Marlex®	ADM	Versatex™	Versatex	Versatex	Versatex	Bard Soft Mesh	–
Mesh size, cm	30 x 30, 30 x 52	52 x 74	50 x 52	15 x 25	50 x 50	50 x 50	15 x 15	50 x 50	30 x 30	–
Biologic mesh	–	–	–	+	–	–	–	–	–	–
Anterior CS	–	–	–	+	–	–	–	–	–	–
Posterior CS	+	+	+	–	+	+	+	+	+	+

- continued

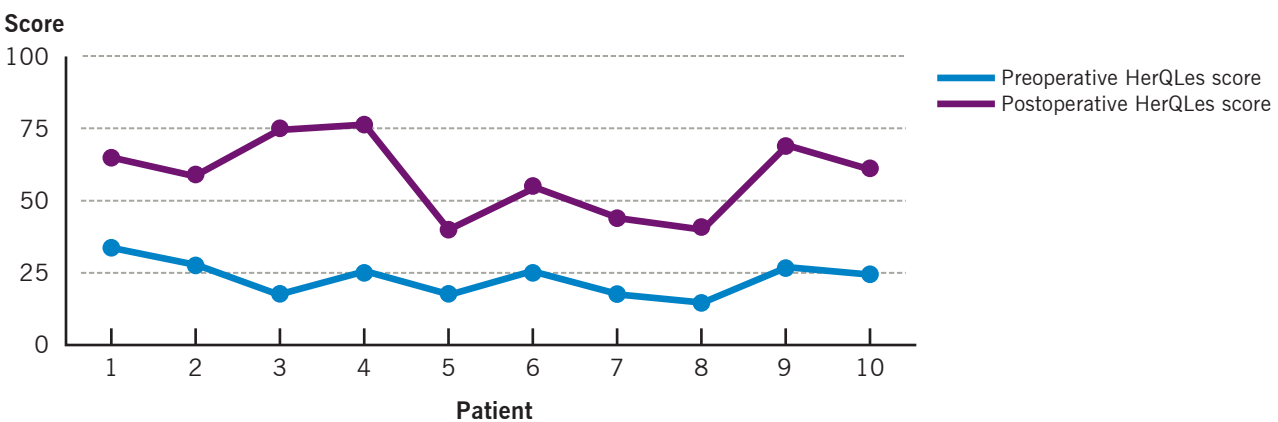
Patients (N = 10)	1	2	3	4	5	6	7	8	9	10
Posterior CS	+	+	+	–	+	+	+	+	+	+
Microsurgical flap	LAD	LAD	LAD	Innervated LAD	LAD	ALT	ALT/VL	ALT	ALT	ALT
Recipient vessels	DLCF	IE	IE	IE	DLCF	IE	IE	IE	IE	IE
Arteriovenous loop graft	+	–	–	–	+	–	–	–	–	–
Flap success	+	+	+	+	+	+	+	+	+	+
Minor complications	+	–	–	–	+	–	–	–	–	–
Hernia recurrence	–	–	–	–	–	–	–	–	–	–
Follow-up, mo	12	15	17	36	11	9	9	9	10	24
Preoperative HerQLes score	33	27	17	25	16	24	17	14	26	23
Postoperative HerQLes score	64	57	73	75	39	53	43	38	68	69

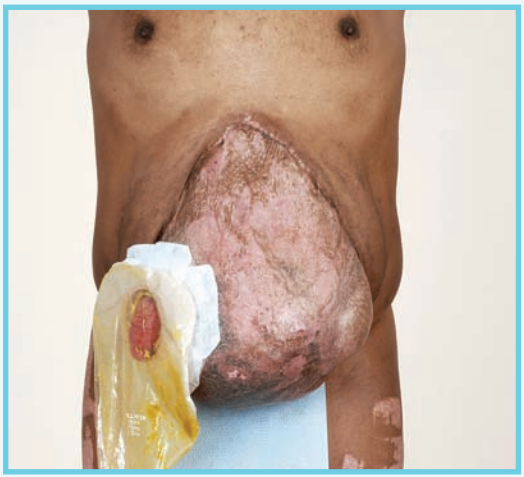
ADM = acellular dermal matrix, ALT = anterolateral thigh flap, ASA = American Society of Anesthesiologists, COPD = chronic obstructive pulmonary disease, CS = components separation, DLCF = descending lateral circumflex femoral, HTN = hypertension, IE = inferior epigastric, LAD = latissimus dorsi flap, VL = vastus lateralis flap

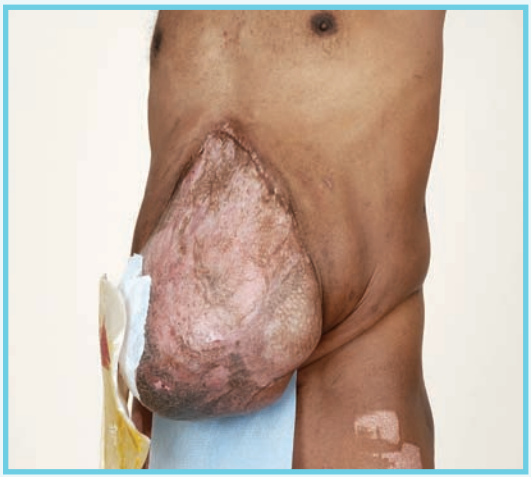
Patient demographics, comorbidities, hernia grade,[2] type of mesh and microsurgical flap, and HerQLes survey scores were reviewed. All microsurgical flaps survived. The average follow-up period was 15.2 (range 9–36) months. Quality of life is an important component of surgical management of complex abdominal hernias/defects.

Preoperative and Postoperative HerQLes Scores (N = 10)

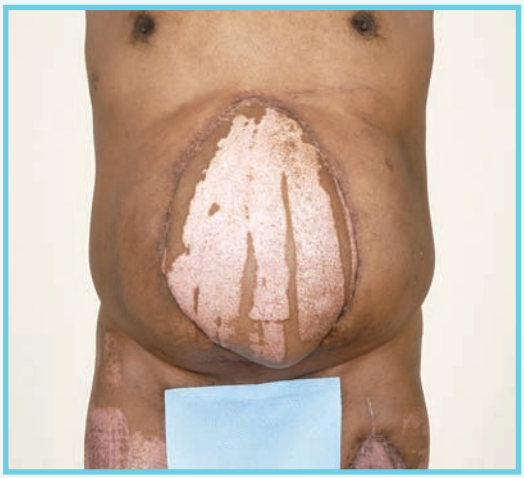
2014 – 2016

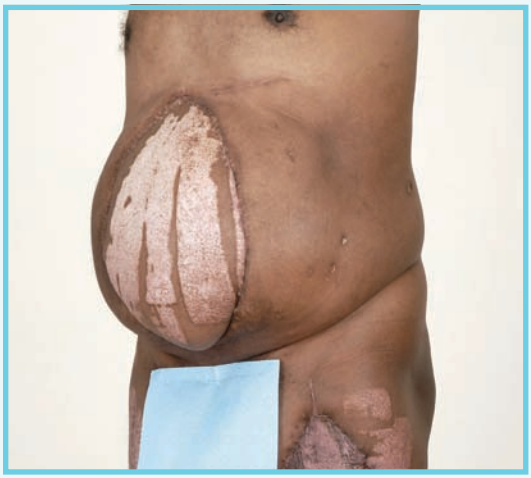






A 45-year old male with a history of hemorrhagic pancreatitis who was left with an open abdomen had a first hernia repair with Vicryl® mesh and split thickness skin graft, which is shown healed.





The patient is shown after resection of the split thickness skin graft, take down of an enterocutaneous fistula with small bowel resection and primary anastomosis, retrorectus implantation of mesh after posterior components separation and transverse abdominis release, and a free anterolateral thigh flap for soft tissue reconstruction over the mesh.

References

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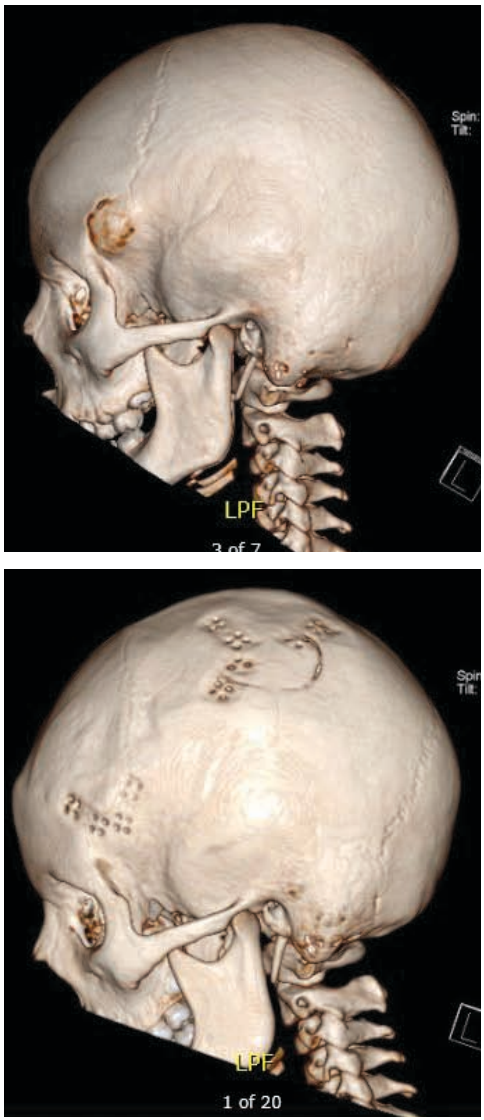
Large Cranial Defect Reconstruction With Autologous Calvarial Bone Graft

Reconstruction of secondary calvarial defects represents a challenge, particularly in complex patients with increased susceptibility to complications. Autologous reconstruction presents the advantages of biocompatibility, biointegration, and growth potential at the expense of donor site morbidity and the possibility of resorption. Institute researchers reviewed split calvarial bone graft (SCBG) skull reconstruction cases and analyzed risk factors for poor outcomes.

Between 1981 and 2016, 40 patients underwent cranioplasty with SCBG. Logistic regression and chi-square or Fisher exact tests were used for analysis.

Average patient age was 33.2 years and mean follow-up was 27.6 months. The mean cranial defect size was 65 cm^2 (range 5 cm^2–314 cm^2). The majority of patients (73%) had significant comorbidities or risk factors; 43% had suffered a bone flap or alloplastic material infection prior to reconstruction. Despite 91% of patients having a significant comorbidity or risk factor, only 28% experienced a major complication after SCBG. There was no statistically significant difference in complication rates in the pediatric population (3/15) compared with adults (8/25) ($P = 0.48$). Prior infection did not increase the likelihood of complication ($P = 0.80$). Patients who smoked (OR, 5.21; $P = 0.04$) were more likely to require a repeat operation.

Skull reconstruction with SCBG in the setting of significant comorbidities and risk factors yields a high first-attempt success rate (72%) that is superior to that seen using alloplastic materials, with good longevity, biocompatibility, and biointegration.



A 10-year-old presented with a growing skull mass in the left frontal area (top). A split calvarial bone graft was harvested from the left parietal region and used to reconstruct the defect after resection. Results after 1 year show stable healing of both donor and recipient sites and resorption of the plates used for fixation (bottom).

Nasoalveolar Molding Comparable to Lip Adhesion Prior to Repair of Wide Cleft Lip and Palate and Severe Nasal Deformity

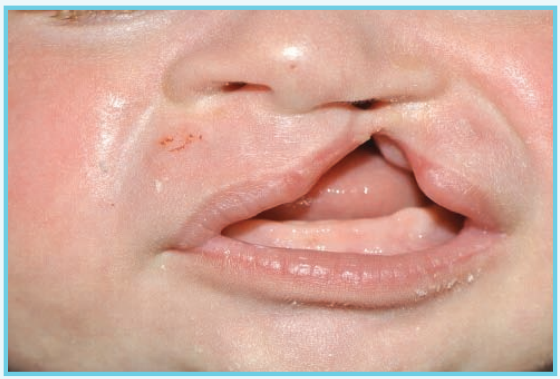
Patients with wide cleft lip and palate may benefit from surgical or orthodontic modalities to align alveolar segments, decrease cleft width, and improve nasal contour before formal cleft lip repair. Both cleft lip adhesion and nasoalveolar molding (NAM) before formal cleft lip repair can assist in improving overall aesthetic outcomes after repair.

Cleft lip adhesion entails temporary surgical approximation of the lip at 2–3 months of age followed by formal lip repair at 5–6 months. Lip adhesion stretches the soft tissues and passively aligns the alveolar segments, thus facilitating a final repair performed without tension and the risk of repair breakdown.

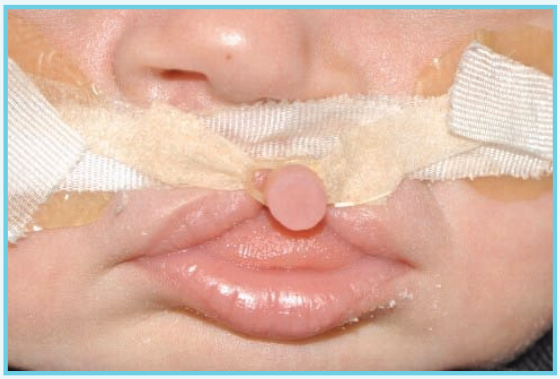
NAM is a newer, noninvasive remodeling of the soft tissues of the lip and nose and realignment of the alveolar segments prior to definitive lip repair. An impression is made of the palate within the first week of life and is used to make a mold plate, which is inserted intraorally and adjusted weekly to align the alveolar segments. This usually allows for formal cleft lip repair between 3 and 5 months of age and eliminates a preparatory surgical procedure; however, weekly dental visits and high family compliance are required.

In 2015 and 2016, the Plastic Surgery Department assessed 21 patients presenting with cleft lip and palate, including 11 affected by wide clefts (> 1 cm) and severe nasal deformity. Five of these patients completed NAM during a 12-week period. One patient couldn't tolerate NAM and 5 families denied the treatment plan offered. After NAM, all 5 patients underwent one-stage cleft lip repair and cleft rhinoplasty at an average age of 4.5 months.

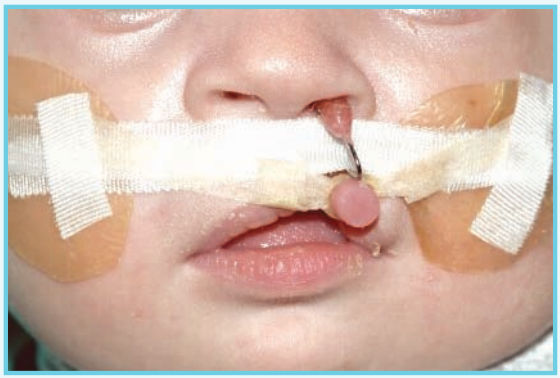
One-year follow-up showed decreased alveolar gap, lengthened columella, and increased nasal tip projection and convexity comparable to lip repairs in babies with narrow clefts and to lip adhesion with the benefit of 1 less surgical procedure.



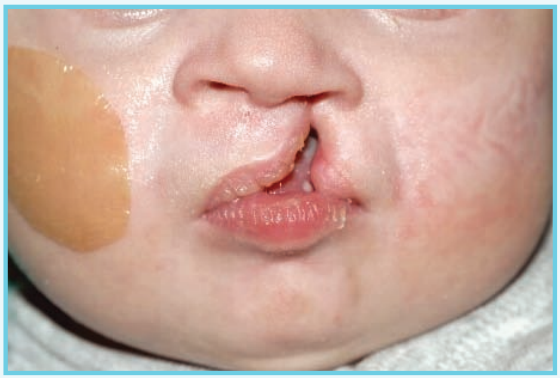
An infant with wide cleft lip and palate and nasal deformity prior to treatment.



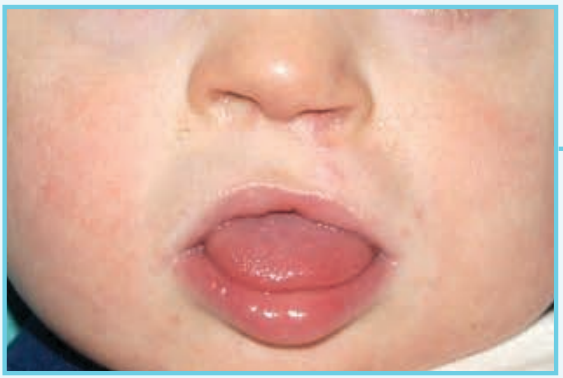
The nasoalveolar device is applied and taped in position.



The nose piece is inserted into the nostril and pushes the lower and upper lateral cartilages up and medially, progressively bringing the alveolar segments together.



The patient after nasoalveolar molding is completed.



The patient 4 months after a single stage cleft lip repair, showing good symmetry of the nose and Cupid's bow.

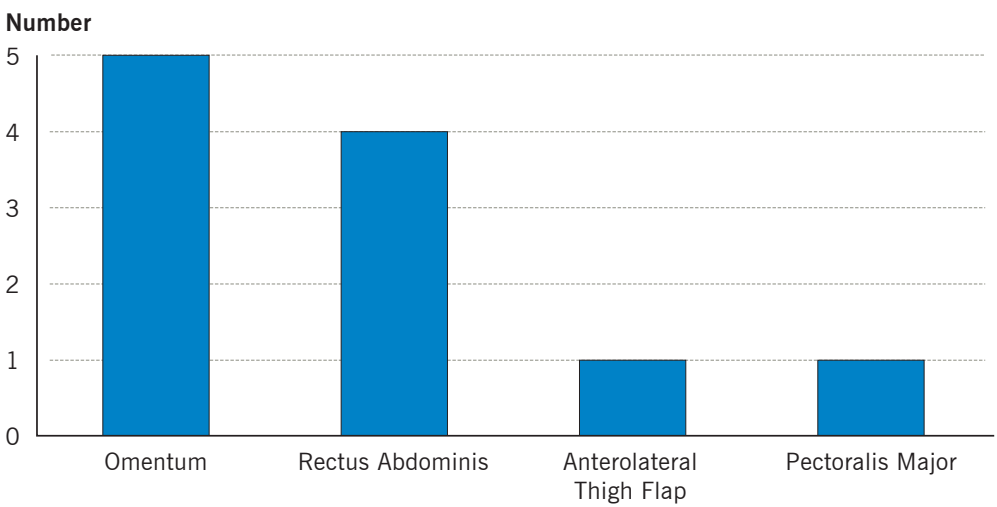
Long-Term Analysis of Flap Coverage of Exposed Cardiac Ventricular Assist Devices

Ventricular assist device (VAD) infections pose a dire challenge by impeding either the device's role as a bridge to heart transplant or as temporary support while waiting for a donor heart. Infections can also shorten the life span of patients with permanent VADs, also called destination therapy. The literature supports evidence that flap coverage may resolve an infection by delivery of immune cells and antibiotics through the flap's rich vasculature.[1,2] A recent study, with the largest cohort of patients to date (20 flaps in 15 infected VAD patients) included only short-term results, such as procedural complications.[3]

To study long-term results, the institute conducted a retrospective chart review of 351 VAD cases and identified 9 patients with VAD infections treated with 11 flaps. The patients underwent flap procedures from 2004 to 2015. Seven patients had permanently placed VADs and 2 were heart transplant candidates.

Flaps Used for Ventricular Device Coverage (N = 11)

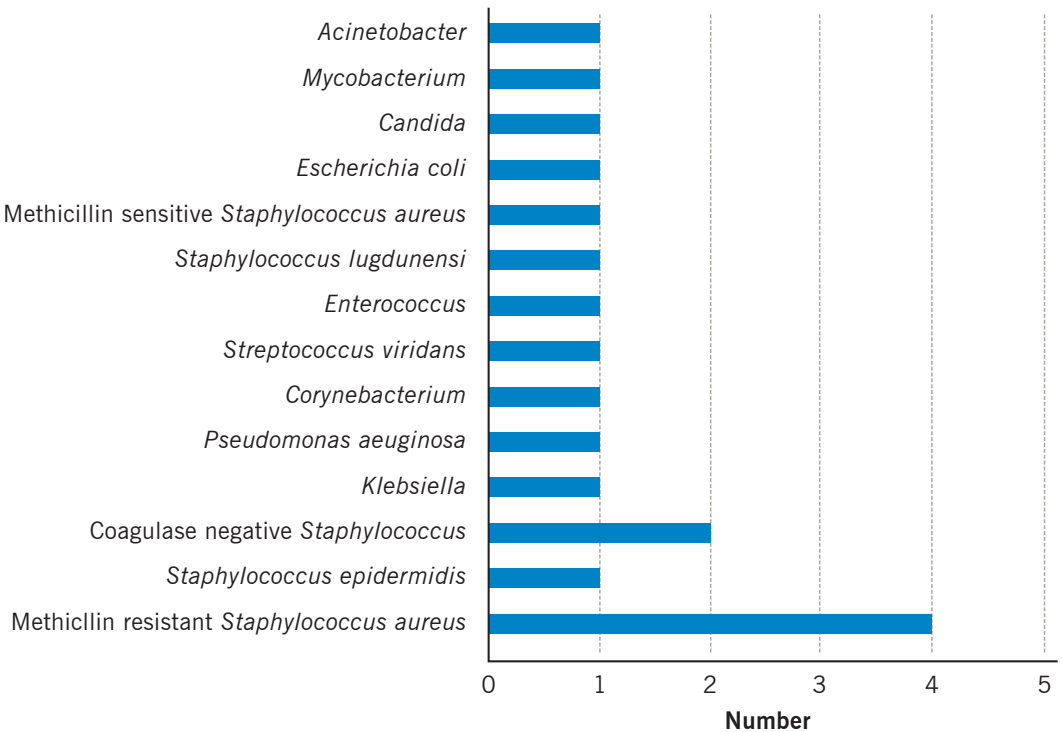
2004 – 2015



Among the 9 flap patients, there were 4 driveline, 5 pump pocket, and 6 sternal wound infections. The most frequent infectious agent was methicillin resistant *Staphylococcus aureus*. Patients underwent an average of 1.3 ± 0.86 (range 0–3) surgical procedures to fight the infection prior to flap coverage, including debridement, vacuum-assisted closure therapy, and incision and drainage.

Microorganisms in Ventricular Device Infections in Patients Treated With Flap Coverage (N = 9)[a]

2004 – 2015



[a]Some patients had more than one infection

Outcomes of Infected VAD Patients With Flap Coverage (N = 9)

2004 – 2016

Age/ Gender	Device/ Purpose	Organism(s)	Flap	Last Follow-up/Death (days from first VAD placement)	Infection Still Present	Condition at Last Follow-Up
68 M	LVAD/DT	MRSA	Omentum	754	Yes	Death: sepsis from gallstone pancreatitis
58 M	LVAD/DT	*Staphylococcus epidermidis, Klebsiella, Pseudomonas,* MRSA *Acinetobacter*	Rectus abdominis, right anterolateral thigh flap[a]	1097	No	Alive: on oral antibiotics
39 M	LVAD/DT	Coagulase-negative *Staphylococcus*	Rectus abdominis	1085	No	Alive: no antibiotics
49 M	LVAD/DT	MRSA	Rectus abdominis, pectoralis major	235	Yes	Death: septic emboli to brain
58 F	LVAD/DT	*Corynebacterium, Viridans Streptococcus, Enterococcus*	Rectus abdominis	1448	Yes	Death: sepsis and device erosion into stomach
63 F	LVAD/BT	Coagulase-negative *Staphylococcus, S. lugdunensis*	Omentum	442	Yes	Death: sepsis from bacterial endocarditis
50 M	BIVAD/BD	MRSA, E. coli	Omentum	227	Yes	Death: sepsis from chronic MRSA device and Acinetobacter PICC line infection infection
58 M	LVAD/DT	MSSA	Omentum	613 cardiogenic shock	Yes	Death: LVAD thrombosis
68 M	LVAD/DT	*Candida Mycobacterium*	Omentum[b]	532	Yes	Death: cardiogenic shock/renal failure leading to multiorgan failure

BD = bridge to transplant decision, BIVAD = biventricular assist device, BT = bridge to transplant, DT = destination therapy (permanent), LVAD = left ventricular assist device, MRSA = methicillin resistant *Staphylococcus aureus*, MSSA = methicillin sensitive *S. aureus*

[a] Anterolateral thigh flap was done following fat necrosis of abdominal tissue after the harvest of the rectus flap in surgery prior.

[b] Omental flap was complicated by flap thrombosis and necrosis needing later debridement.

Of the 9 patients, 7 died — 5, including the 2 heart transplant candidates, died from a septic cause. Mean survival was 607 ± 417 (range 227–1448) postoperative days after initial VAD placement. This is in sharp contrast to the average 4.4-year (1607 days) life of a noninfected VAD in a permanent therapy patient.[2] Eight flap patients continued to battle a chronic VAD infection at time of death or last follow-up.

These long-term data reveal that flap coverage may not be as beneficial in infected VAD patients as once thought, although it is an attempt to avoid more aggressive procedures such as device exchange. Managing predisposing factors to VAD infection, which include nutritional deficiency, immobilization, and prolonged use of indwelling catheters/lines, is crucial to survival of VAD patients.[1]

References

1. Hutchinson OZ, Oz MC, Ascherman JA. The use of muscle flaps to treat left ventricular assist device infections. *Plast Reconstr Surg*. 2001 Feb;107(2):364-373.
2. Long EF, Swain GW, Mangi AA. Comparative survival and cost-effectiveness of advanced therapies for end-stage heart failure. *Circ Heart Fail*. 2014 May;7(3):470-478.
3. Roussel LO, Khouri JS, Christiano JG. Pedicled flap closure as an adjunct for infected ventricular assist devices. *Ann Plast Surg*. 2017 June;78:712-716.

Lichen Planopilaris Comorbidities

To determine the prevalence of systemic comorbid conditions, nutritional deficiencies, psychological problems, and skin cancers in patients with lichen planopilaris (LPP), the Department of Dermatology conducted a retrospective, case-control study including 334 LPP patients and 78 control subjects seen at Cleveland Clinic from 2000 to 2016.

Sleep problems, hirsutism, vitamin D deficiency, depression, diabetes mellitus type 2, Hashimoto thyroiditis, hyperlipidemia, hypothyroidism, and allergic rhinitis were all significantly associated with LPP. Several other comorbidities were prevalent in the LPP cohort, but not significantly associated. It is important for clinicians to understand the role of atopy, autoimmune disorders, endocrine disorders, nutritional deficiencies, psychological problems, and skin cancers in scarring alopecia patients.

These results emphasize that dermatologists should screen LPP patients for autoimmune disorders associated with LPP and conduct complete metabolic workups to avoid missing other abnormalities. Further larger scale studies are needed to confirm the significance of these findings in LPP patients.

Demographic Data of Lichen Planopilaris Patients vs Controls

2000 – 2016

Category	Controls, N (%) (N = 78)	Lichen Planopilaris, N (%) (N = 334)	*P* Value
Gender			< 0.001
Female	62 (79.5)	311 (93.1)	
Male	16 (20.5)	23 (6.9)	
Mean age ± SD at diagnosis, years	52.19 ± 15.37	54.77 ± 12.83	0.12
Race			0.75
White	55 (70.5)	221 (66.2)	
Black	17 (21.8)	86 (25.7)	
Other	6 (7.7)	27 (8.1)	

Systemic Comorbid Conditions in Lichen Planopilaris Patients vs Controls

2000 – 2016

Characteristic	Controls, N (%) (N = 78)	Lichen Planopilaris, N (%) (N = 334)	*P* Value	OR (95% CI)
Atopy				
Allergic rhinitis	19 (24.4)	50 (15)	**0.046**	0.55 (0.30-0.99
Atopic dermatitis	10 (12.8)	42 (12.6)	0.953	0.98 (0.46-2.05)
Asthma	12 (15.4)	33 (9.9)	0.161	0.60 (0.29-1.23)
Autoimmune disorders				
Hashimoto thyroiditis	0	21 (6.3)	**0.023**	0.80 (0.76-0.84)
Systemic lupus erythematosus	1 (1.3)	5 (1.5)	0.887	1.17 (0.14-10.16)
Rheumatoid arthritis	1 (1.3)	4 (1.2)	0.951	0.93 (0.10-8.47)
Psoriasis	1 (1.3)	7 (2.1)	0.639	1.65 (0.20-13.59)
Sarcoidosis	1 (1.3)	4 (1.2)	0.951	0.93 (0.10-8.47)
Celiac disease	2 (2.6)	4 (1.2)	0.364	0.46 (0.08-2.56)
Ulcerative colitis	2 (2.6)	4 (1.2)	0.364	0.46 (0.83-2.56)
Vitiligo	1 (1.3)	2 (0.6)	0.523	0.46 (0.04-5.18)
Sjögren syndrome	1 (1.3)	2 (0.6)	0.523	0.46 (0.04-5.18)
Limited scleroderma, systemic sclerosis	0	3 (0.9)	0.401	0.80 (0.77-0.85)
Thyroid Gland Disease				
Hypothyroidism	10 (12.8)	81 (24.3)	**0.028**	2.18 (1.07-4.43)
Other thyroid disease	6 (7.7)	25 (7.5)	0.950	0.97 (0.38-2.45)
Hyperthyroid	1 (1.3)	4 (1.2)	0.951	0.93 (0.10-8.47)
Goiter	3 (3.8)	10 (3.0)	0.698	0.77 (0.21-2.87)
Nodules	1 (1.3)	3 (0.90)	0.756	0.69 (0.07-6.80)
Subacute thyroiditis	0	1 (0.30)	0.628	0.81 (0.77-0.85)

- continued

Systemic Comorbid Conditions in Lichen Planopilaris Patients vs Controls

2000 – 2016

Characteristic	Controls, N (%) (N = 78)	Lichen Planopilaris, N (%) (N = 334)	*P* Value	OR (95% CI)
Metabolic Conditions				
Diabetes mellitus type 2	17 (21.8)	39 (11.7)	**0.019**	0.47 (0.25-0.89)
Hyperlipidemia	41 (52.6)	129 (38.6)	**0.024**	0.57 (0.35-0.93)
Obesity (body mass index > 30)	27 (34.6)	109 (32.6)	0.738	0.92 (0.54-1.54)
Endocrine Disorders				
Hirsutism	1 (1.3)	38 (11.4)	**0.006**	9.88 (1.34-73.14)
Hyperparathyroidism	3 (3.8)	3 (0.9)	0.050	0.23 (0.05-1.15)
Deficiency				
Vitamin D	51 (65.4)	167 (50)	**0.014**	0.53 (0.32-0.88)
Anemia	17 (21.8)	60 (18)	0.435	0.79 (0.43-1.44)
Iron	5 (6.4)	27 (8.1)	0.619	1.29 (0.48-3.45)
Psychological Problems				
Anxiety	10 (12.80)	35 (10.50)	0.551	0.79 (0.38-1.69)
Depression	21 (28.90)	52 (15.60)	**0.018**	0.50 (0.28-0.89)
Sleep disturbance	23 (29.50)	25 (7.50)	**< 0.001**	0.19 (0.10-0.36)

Prevalence of Skin Cancers in Lichen Planopilaris Patients vs Controls

2000 – 2016

Characteristic	Controls, N (%) (N = 78)	Lichen Planopilaris, N (%) (N = 334)	*P* Value	OR (95% CI)
Nonmelanoma skin cancer	3 (3.80)	4 (1.20)	0.103	0.30 (0.06-1.38)
Basal cell carcinoma	1 (1.3)	15 (4.5)	0.187	3.62 (0.47-27.83)
Melanoma	1 (1.3)	1 (0.3)	0.261	0.23 (0.01-3.74)
Squamous cell carcinoma	2 (2.6)	6 (1.8)	0.658	0.69 (0.14-3.51)

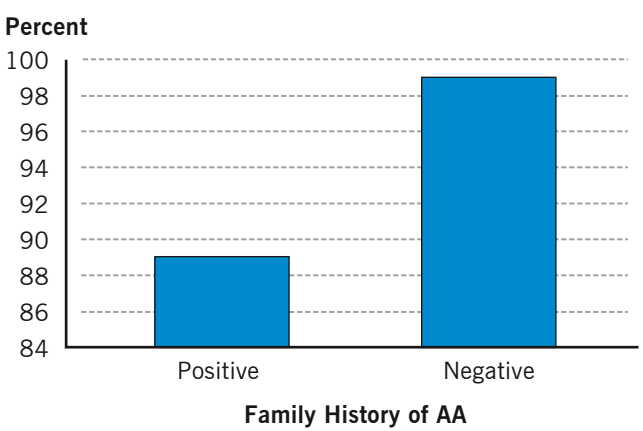
Function of Family History in Patchy Alopecia Areata

A family history of alopecia areata (AA) has been associated with alopecia universalis and alopecia totalis, but its impact in patchy alopecia (PA) remains unclear. The Department of Dermatology retrospectively studied 256 patchy alopecia patients seen from 2000 to 2016 to assess the relationship of a family history of AA with demographics, triggers, autoimmune comorbidities, disease severity and course, response to treatment, and relapse rate in PA. Comparisons were drawn using Pearson chi-square, Fisher exact, and Wilcoxon rank sum tests as well as t tests as appropriate.

A family history of AA was associated with reduced hair regrowth after PA relapses. Furthermore, family history of autoimmunity other than AA was associated with autoimmune comorbidities, positive microsomal antibodies, earlier age of onset of PA symptoms, and abnormally high ferritin levels in PA patients.

Hair Regrowth After Patchy Alopecia Relapse (N = 256)

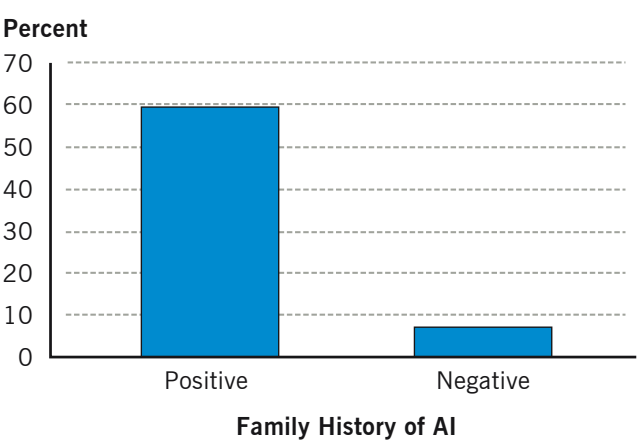
2000 – 2016



AA = alopecia areata

Presence of Autoimmune Comorbidities in Patchy Alopecia Patients With Family History of Alopecia Areata (N = 256)

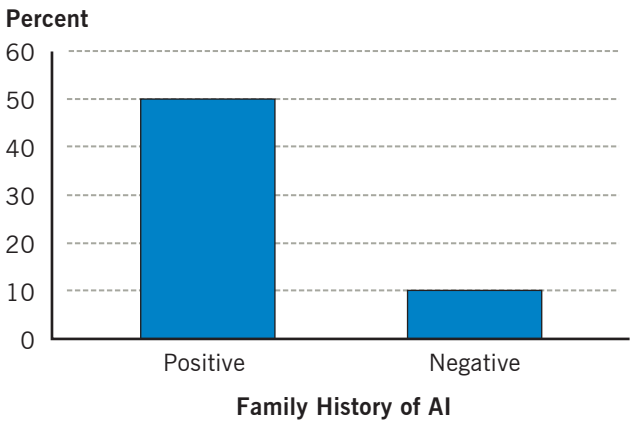
2000 – 2016



AI = autoimmunity

Presence of Antithyroid Microsomal Antibody in Patchy Alopecia Patients With Family History of Alopecia Areata (N = 256)

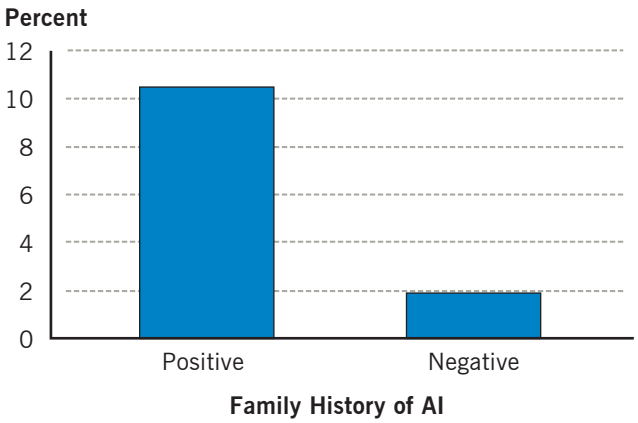
2000 – 2016



AI = autoimmunity

Presence of Abnormally Elevated Serum Transferritin Level in Patients With a Negative Family History of Alopecia Areata (N = 256)

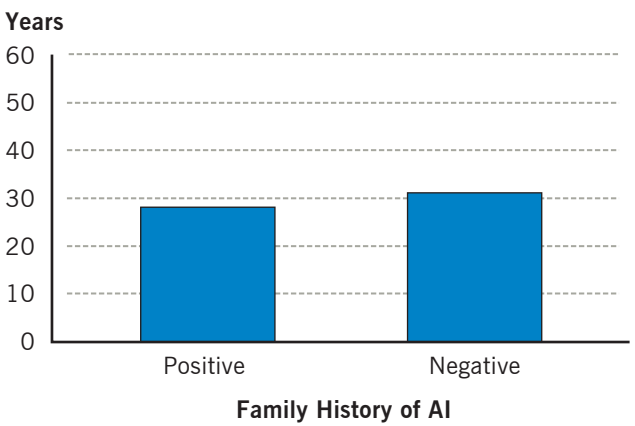
2000 – 2016



AI = autoimmunity

Age of Onset of Patchy Alopecia Symptoms in Patients With a Negative Family History of Alopecia Areata (N = 256)

2000 – 2016



AI = autoimmunity

Common PA triggers included stress and fatigue, illnesses, thyroid disorders, and season changes. Common comorbidities included dermatologic disorders (eg, acne, eczema, rosacea), atopy, and autoimmune diseases.

Clinical and laboratory assessments for concomitant autoimmune disease should be considered for PA patients. Additionally, physicians should discuss avoiding common PA triggers with these patients and offer alternative treatment regimens when relapse is persistent or regrowth is not ideal.

Reference

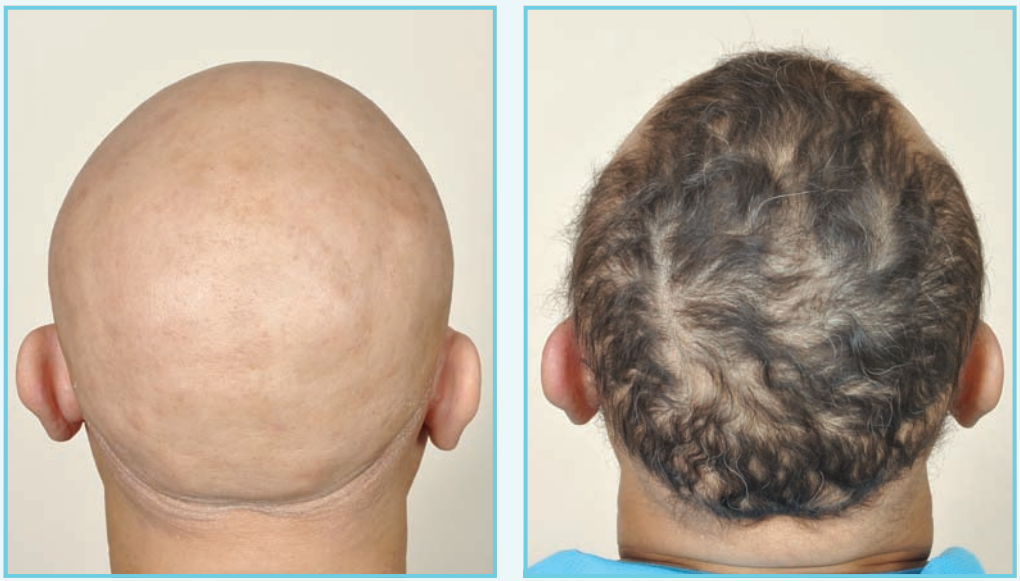
1. Jia WX, Mao QX, Xiao XM, Li ZL, Yu RX, Li CR. Patchy alopecia areata sparing gray hairs: a case series. *Postepy Dermatol Alergol*. 2014 May;31(2):113-116.

Treatment of Severe Alopecia Areata with Oral Tofacitinib Citrate

Tofacitinib is a janus kinase 1/3 inhibitor that is FDA-approved for the treatment of rheumatoid arthritis and that has recently been used to treat alopecia areata (AA). The Department of Dermatology conducted a retrospective chart review of 13 AA patients presenting from March 2015 to November 2016, including 9 with alopecia totalis or alopecia universalis, with a mean pretreatment scalp hair loss of 93% calculated using the Severity of Alopecia Tool (SALT) score. All other AA therapies were stopped, and they were treated with tofacitinib initiated at 5 mg twice daily. Tofacitinib dose was titrated by 5 mg/day per month until the treating physician noted the first signs of regrowth, and then was maintained at that dose.

Regrowth, as measured by SALT and Wilcoxon signed-rank test, ranged from 2% to 90%, with a mean of 44.3% and median of 50.5% ($P < 0.05$). Seven patients (53.8%) achieved a regrowth of at least 50%. Response time ranged from 1 to 9 months, with an average of 4.2 months. One patient developed a morbilliform eruption and peripheral edema leading to tofacitinib discontinuation. Two patients stopped therapy after 3 months due to loss of insurance and within 2 weeks experienced shedding leading back to baseline. The remaining 10 patients continued treatment. Notably, 2 patients demonstrated lipid and liver abnormalities that resolved with dose reductions.

These results show that while tofacitinib is an effective treatment for severe AA, it lacks durability of effect when therapy is discontinued.



Patient 7 presented with alopecia totalis and attained 90% regrowth after 3 months of oral tofacitinib.

Characteristics of Alopecia Areata Patients Treated With Tofacitinib (N = 13)

March 2015 – November 2016

Patient #	Gender	Age (Decade)	Prior Failed Therapies	Disease Duration (Years)	Months Until Response	Duration of Therapy (Months)	Holding Dose, mg/day (Twice Daily)
1	F	20	TC, ILC, MTX, DPCP	16	5	7	20
2	M	20	TC, ILC	5	–	4	10
3	F	30	MTX, Infx, TC, DPCP	8	4	12	15
4	F	30	ILC, TC, DPCP, TM	13	–	0.5	–
5	F	40	ILC, TC, TM, DPCP, anthralin	35	1	3	10
6	F	50	ILC, TC, TM, DPCP, anthralin	18	3	6	10
7	F	50	ILC, TC, TM, DPCP, excimer laser	30	3	3	10
8	F	50	ILC, TC, TM, DPCP	54	9	10	20
9	F	50	ILC, TC, TM, DPCP	11	2	4	25[a]
10	F	50	ILC, TC, TM, DPCP	15	4	5	10
11	F	50	ILC, TC, TM, DPCP, MTX	15	3	9	20
12	F	50	SC, TC, Cys, Infx, squaric acid	8	9	13	20
13	F	60	ILC, TC, TM, DPCP, anthralin	6	3	7	20
Mean				**18**	**4.2**	**6.4**	**15.8**
Median							

AT = alopecia totalis, AU = alopecia universalis, Cys = cyclosporine, DPCP = diphenylcyclopropenone, ILC = intralesional corticosteroids, Infx = infliximab, MTX = methotrexate, SC = systemic corticosteroids, TC = topical corticosteroids, TM = topical minoxidil

[a]This patient was the exception to the standard protocol and was started at 10 mg twice daily.

[b]Abnormalities noted at 25 mg daily dose — aspartate transaminase increased to 43 IU/L and alanine transaminase at 48 IU/L — resolved at 15 mg daily dose, and regrowth began at this dose as well.

[c]The patient developed a rash and peripheral edema within 2 weeks of therapy that resolved completely 2 weeks after medication withdrawal.

[d]Abnormalities noted at 30 mg daily dose — total cholesterol increased to 270 mg/dL and low-density lipoprotein to 175 mg/dL — resolved at 20 mg daily dose.

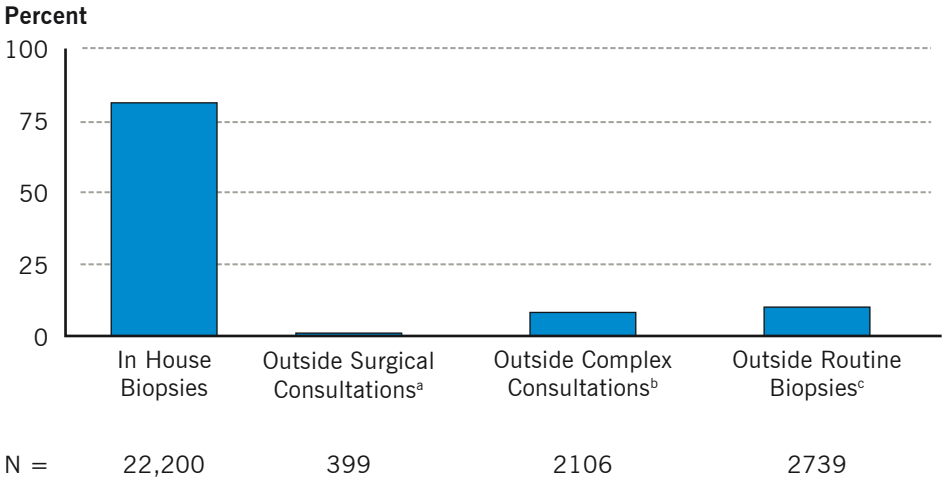
Baseline Scalp Involvement, % (Subtype)	Duration of AT or AU Episode, if Present (Years)	Follow-Up Scalp Involvement, %	Regrowth, %	Adverse Events
100 (AU)	4	90	10	
100 (AU)	1.5	100	0	
100 (AU)	3	98	2	Liver enzyme abnormalities[b]
100 (AT)	1	–	–	Rash, peripheral edema[c]
79.30	–	40	50	
78.30	–	39.6	49	
100 (AU)	1	10	90	
100 (AU)	7	40.1	60	Lipid abnormalities[d]
71.60	–	35	51	
100 (AT)	2	30.8	69	
76	–	15	80	
100 (AU)	7	35.4	65	
100 (AU)	3	95	5	
92.7	**3.3**	**52.4**	**44.30**	
77.2	**3.0**	**39.8**	**50.5**	

Dermatopathology Turnaround Times

The institute reports 2016 intralaboratory timeliness, or turnaround times (TAT), of more than 27,400 routine surgical pathology biopsies and external complex consultations from the time of specimen accessioning to report completion. The goal is to meet or exceed the College of American Pathologists recommended benchmark of 2 working days.[1] The TAT for the vast majority (77%) of specimens was 1 day with a total of 93% signed out within 2 days. TATs are variable depending on case complexity as well as other factors such as presence of a residency training program and the number of hospital beds and surgical pathologists.

Percentage of Dermatopathology Cases Completed (N = 27,444)

2016



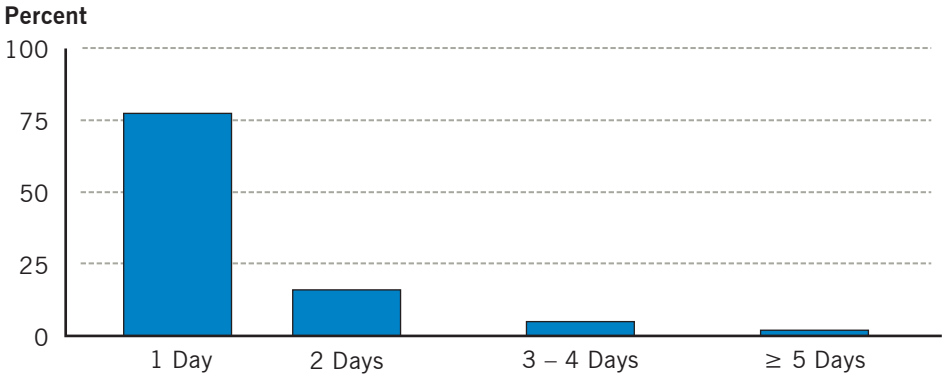
[a]Outside surgical consultations = outside cases referred by Cleveland Clinic clinicians for review and expert opinion by institute pathologists

[b]Outside complex consultations = cases referred by other pathologists for expert opinion

[c]Outside routine biopsies = routine cases referred by clinicians outside Cleveland Clinic

Dermatopathology Turnaround Times (N = 27,444)

2016



Reference

1. Association of Directors of Anatomic and Surgical Pathology, Nakhleh R, Coffin C, Cooper K. Recommendations for quality assurance and improvement in surgical and autopsy pathology. *Hum Pathol*. 2006 Aug;37(8):985-988.

Treatment of Refractory Dermatomyositis With Intravenous Immunoglobulin

Rheumatic skin diseases are often refractory to multiple treatments, leading to unrelenting physical and psychological effects that have a significant negative impact on patients' quality of life. Dermatomyositis (DM) research has suggested that active skin disease often persists despite adequate myositis control.[1-3] Cleveland Clinic medical dermatologists focus their practice and research on finding better treatments for these challenging patients.

A review of outcomes for the large Cleveland Clinic cohort of DM patients revealed that intravenous immunoglobulin (IVIG) treatments can be extremely effective for those with refractory cutaneous disease. Of 50 patients with refractory cutaneous DM with or without refractory myositis or interstitial lung disease treated with IVIG, 40 (80%) had meaningful cutaneous DM improvement. This included 87% of DM patients treated with IVIG for refractory skin disease alone and 77.1% treated for refractory skin/muscle/lung disease. Cutaneous DM improvement occurred regardless of DM subtype, and IVIG use resulted in decreased systemic corticosteroid exposure in 83% of patients.

These findings suggest that IVIG can be both a clinically effective and cost-effective treatment for refractory cutaneous DM. The Department of Dermatology plans to embark on a prospective study to confirm the benefits of IVIG in refractory cutaneous DM and to continue looking for better treatments for other rheumatic skin diseases such as psoriasis vulgaris, scleroderma/morphea, lupus erythematosus, and cutaneous vasculitis.

Cutaneous Improvement of Refractory Dermatomyositis With IVIG (N = 50)

2004 – 2014

Characteristics	Totals	Cutaneous Improvement With IVIG	*P* Value
Subjects (N)	50	40	NA
Average age (years)	45 ± 22.1	47 ± 21.4	0.13
Gender (female/male)	41/9	35/5	0.04
Mean days from diagnosis to IVIG	504.9	477.3	0.64
Medications prior to IVIG (mean ± SD)	2.6 ± 1.2	2.6 ± 1.2	0.91
DM subtype (N)			
Adult classic	28	21	0.52
Malignancy associated[a]	5	4	
Juvenile	7	5	
Amyopathic	5	5	
Overlapping[b]	5	5	
Reason for IVIG (N)			
Skin only	15	13	0.7
Skin and other disease (muscle, ILD)	35	27	

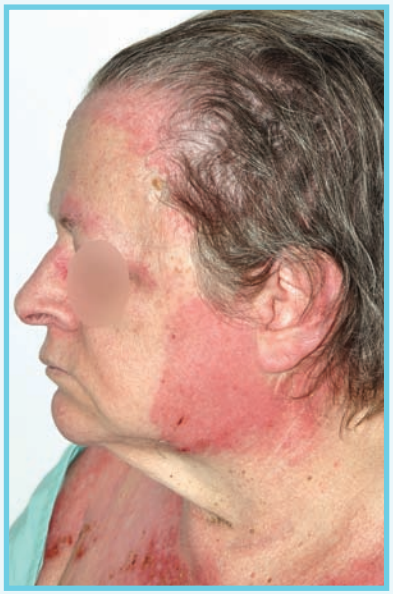
DM = dermatomyositis, ILD = interstitial lung disease, IVIG = intravenous immunoglobulin

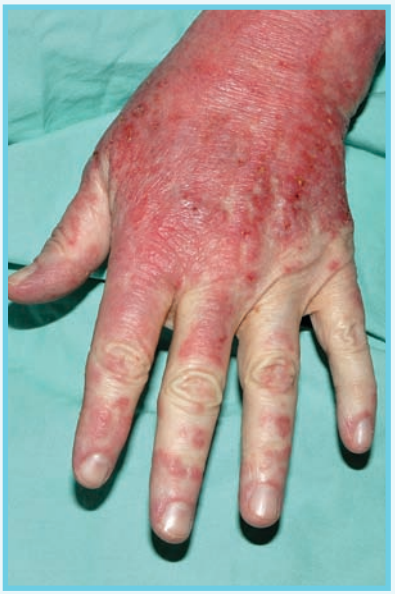
[a]Colorectal carcinoma (2), thyroid papillary carcinoma (1), squamous cell carcinoma of tongue (1), chronic lymphocytic leukemia (1)

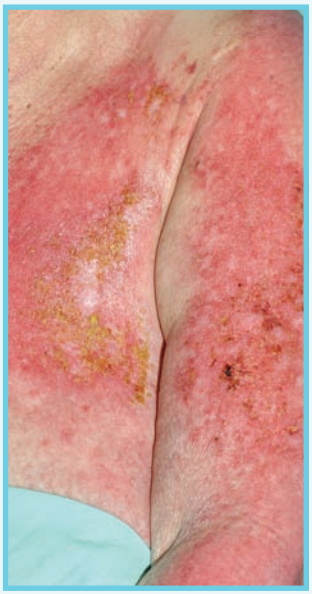
[b]2 patients with overlapping scleroderma features, 3 with overlapping features of systemic lupus erythematosus

Dermatomyositis

Before IVIG

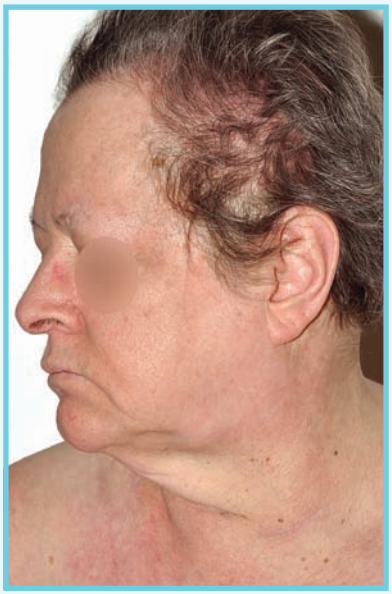


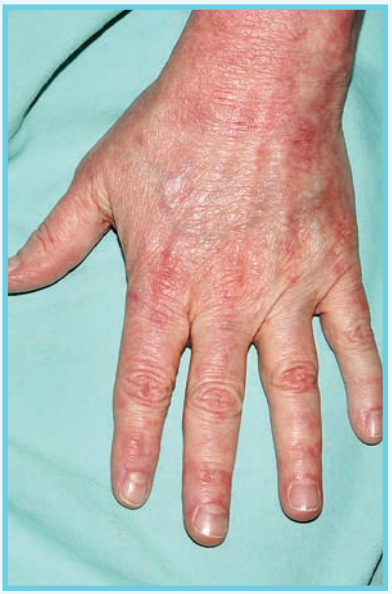


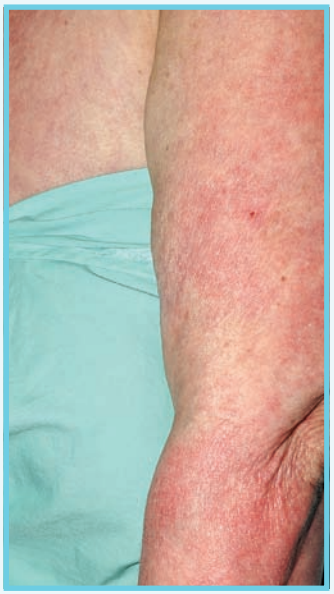


Classic DM in a 61-year-old woman with extensive cutaneous involvement including her scalp, face, trunk, arms, hands, and anterior legs. Serology and histology (both skin and muscle) was consistent with classic DM. Malignancy workup was negative. The patient was hospitalized for pulse methylprednisolone 1 g daily and discharged on numerous medications, including prednisone 40 mg daily, azathioprine 150 mg daily, and hydroxychloroquine 200 mg twice daily. Despite improvement, 2.5 months after diagnosis she had significant skin pain and noted recent worsening of lesions. IVIG 2g/kg monthly was initiated and her other medications continued.

After IVIG







Dramatic improvement observed 5 weeks after IVIG initiation (2 cycles). Patient's skin pain was significantly better, and prednisone was weaned to 20 mg daily while continuing stable doses of IVIG, azathioprine, and hydroxychloroquine.

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Mohs Surgery Quality Metrics

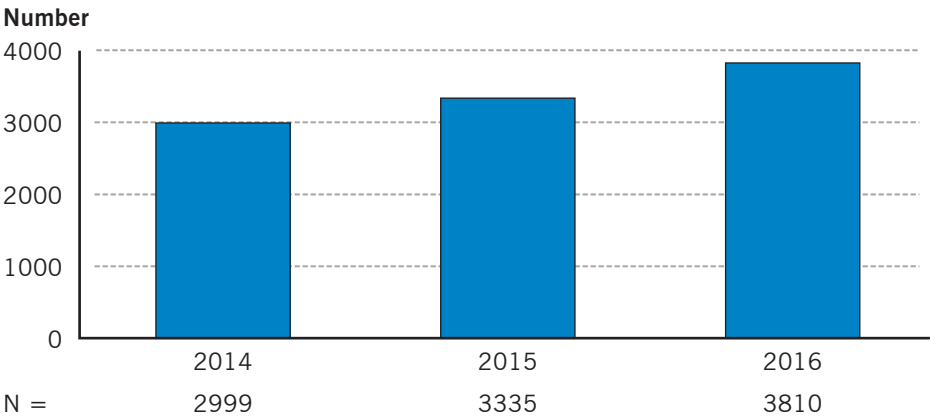
Mohs micrographic surgery provides superior cure rates and tissue sparing in high-risk skin cancers arising in functionally and cosmetically crucial sites. It is most commonly used to treat basal cell and squamous cell carcinomas, as well as other tumors associated with high recurrence rates after wide local excision.

In 2016, the Department of Dermatology's 7 fellowship trained Mohs surgeons in Ohio treated 3810 skin cancer cases at 4 Cleveland Clinic Mohs surgery locations certified by the Clinical Laboratory Improvement Amendments (CLIA). The Mohs surgeons performed 94% of the wound reconstructions for these cases including primary complex closures (64%), primary intermediate closures (9%), flaps (14%), and grafts (4%). Nine percent of wounds were left to heal by secondary intention.

The Center for Medicare & Medicaid Services reported a national mean of 1.7 Mohs layers required to obtain tumor free margins from 2012 to 2014.[1] Cleveland Clinic Mohs surgeons performed within 1 standard deviation of this mean, requiring 1.5 layers per case to achieve a tumor free plane in 2014, 1.3 layers in 2015, and 1.5 layers in 2016.

Number of Mohs Micrographic Surgery Cases (N=10,144)

2014 – 2016



Number of Tumors by Type (N = 10,144)

2014 – 2016

Year	Basal Cell Carcinoma	Squamous Cell Carcinoma	Squamous Cell Carcinoma in Situ	Melanoma in Situ (Lentigo Maligna)	Dermato-fibrosarcoma	Microcystic Adnexal Protuberans	Sebaceous Carcinoma	Merkel Cell Carcinoma	Other[a]
2014	1882	916	134	9	9	3	3	5	38
2015	2083	879	300	13	6	0	3	1	50
2016	2261	1101	401	10	5	1	3	3	25

[a]Including but not limited to porocarcinoma, leiomyosarcoma, atypical fibroxanthoma, Paget disease, digital papillary adenocarcinoma

Reference

1. Krishnan A, Xu T, Hutfless S, Park A, Stasko T, Vidimos AT, Leshin B, Coldiron BM, Bennett RG, Marks VJ, Brandt R, Makary MA, Albertini JG; and the American College of Mohs Surgery Improving Wisely Study Group. Outlier practice patterns in Mohs micrographic surgery: defining the problem and a proposed solution. *JAMA Dermatol*. 2017 Apr 28. doi:10.1001/jamadermatol.2017.1450. [Epub ahead of print]

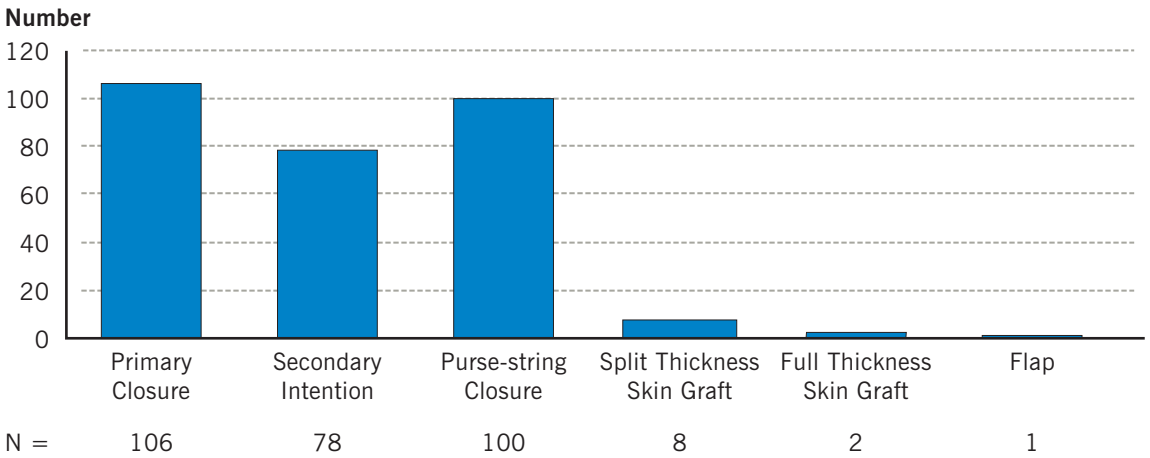
Complication Rates for Closure of Lower Extremity Wounds After Mohs Surgery

Mohs micrographic surgery (MMS) allows for optimal skin cancer cure rates while maximizing conservation of adjacent healthy skin. MMS is commonly used to treat lesions on the leg, and particularly the shin, where poor circulation, edema, lack of tissue laxity, and risk of infection often challenge wound healing. Although large studies are lacking, previous reports cite a complication rate between 6.7% and 18% for full thickness skin grafts for lower leg defects after excisional surgery.[1,2]

Institute researchers compared complication rates associated with second intention healing, primary linear closure, skin graft, and flap repair performed after MMS for 295 leg tumors treated at Cleveland Clinic main campus and 1 family health center between September 2014 and September 2016. Mean patient age was 73 years, and the majority of patients were female (64.6%). The majority of tumors were squamous cell carcinomas (69%), with fewer basal cell carcinomas (29%) and melanomas in situ (1.4%). A majority (69.5%) of tumors were on the anterior shin. An average of 1.2 layers was required to clear the tumors, with an average postoperative defect size of 5.5 cm^2. There was no difference in defect size for patients undergoing secondary intention healing, primary closure, or purse-string closure.

Closure of Lower Extremity Wounds After Mohs Surgery (N = 295)

September 2014 – September 2016

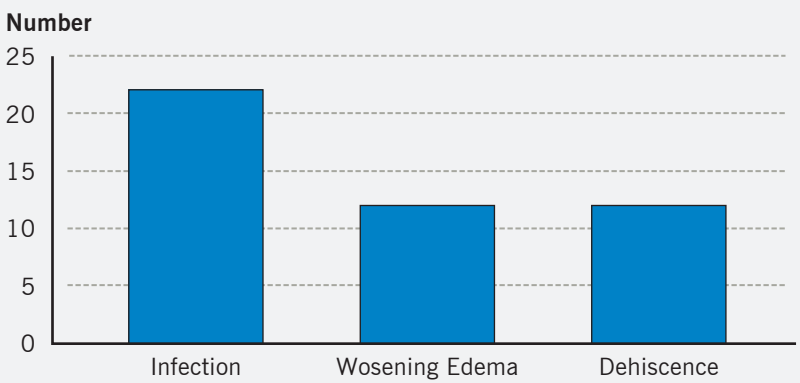


On average, 1.4 postoperative visits were required in the first 90 days after surgery, with no significant difference in number of visits by closure method. A total of 38 (12.9%) patients experienced a surgical complication, and 29 (76%) of those required a total of 32 interventions. There was no significant difference in the complication rate between closure methods for leg wounds after MMS.

The most common complication was infection (7.5%), with fewer episodes of dehiscence (4.1%) and worsening lower extremity edema (4.1%). There were no bleeding complications.

Complications After Lower Extremity Mohs Surgery (N = 38)

September 2014 – September 2016



Use of oral antibiotics was the most common intervention (N = 24, 75%), 7 patients (21.9%) required debridement, and 1 (3.1%) underwent incision and drainage for abscess formation. There was no significant difference in type of intervention based on closure method.

References

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Treatment of Recalcitrant Keloids With CO_2 Laser Excision and Adjuvant Photodynamic Therapy or Radiation

Keloids are notoriously difficult to treat, with high recurrence rates. CO_2 laser excision has been demonstrated in several studies to be a safe and efficacious treatment, and recently, surgical excision with adjuvant external beam radiation therapy (XRT) has been identified as a promising treatment that inhibits keloid angiogenesis and fibroplasia.[1-5] Photodynamic therapy (PDT) has also been shown in vitro to induce apoptosis of keloid fibroblasts.[6-7]

The Department of Dermatology conducted a retrospective chart review of keloid patients who received CO_2 laser excision from August 2012 to December 2016. Outcomes of those having CO_2 laser treatment alone were compared with those seen in patients having adjuvant PDT or XRT.

The 54 patients aged 15 to 72 years included in the study had keloids occurring most frequently on the ear lobe (59.2%), followed by the mandible (9.3%), and chest (3.7%). At the time of initial evaluation, keloids had been present for an average of 7.3 years. Additionally, 48.1% of patients had failed 3 or more conventional treatments (eg, intralesional triamcinolone injections, surgical excision, pulsed dye laser).

All patients underwent ablative CO_2 laser excision (200–300 mJ, 5–28 W, 20–88.8 pulse/sec). Four patients received PDT red light (repeated weekly for 4 weeks), and 8 patients received XRT (1500–2100 Gy in 3 fractions of 7–9 meV over 3 days) immediately following excision. Patients were followed from 2 to 36 months (average of 25.5 months) after treatment, though a notable 18 patients were lost to follow-up.

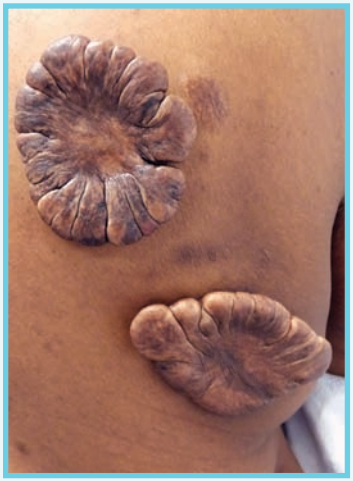
The recurrence rate among patients treated with CO_2 laser excision with XRT was 25%, compared with 37% for those treated with CO_2 laser excision alone, and 75% for patients treated with CO_2 laser excision and PDT. The rate of complications, including pain prompting presentation to the emergency department, infection requiring oral antibiotics, and bleeding, approached 50% for both groups treated with adjuvant therapies compared with 16.6% for CO_2 laser excision alone. Time to recurrence was far greater in the XRT group compared with the CO_2 laser excision and PDT and CO_2 laser excision alone groups.

Comparison of CO_2 Laser Excision With Adjuvant Therapies in Treating Recalcitrant Keloids (N = 54)
August 2012 – December 2016

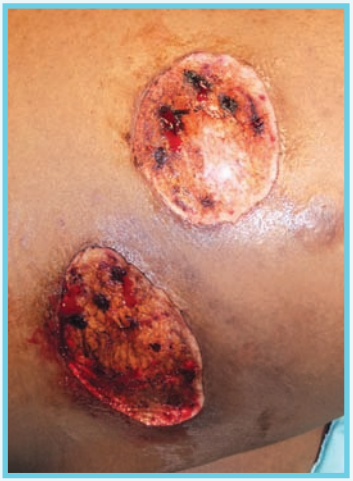
	CO_2 Excision Only	CO_2 and PDT	CO_2 and XRT
Total N	42	4	8
Gender, %			
Male	43.8	75	50
Female	56.2	25	50
Race/Ethnicity, %			
Black	92	75	100
White	6	25	0
Asian	2	0	0
Average keloid duration, y	4.3	14.8	8
Average greatest dimension, cm	2.8	4.7	6.4
Average number of failed therapies	1	2	2.3
Average follow-up time, mo	4.6	11.3	10
Complication rate, %	16.6	50	50
Average recurrence rate, %	37	75	25
Average time to recurrence, mo	6	9.5	22

In addition to the number of patients lost to follow-up, limitations to this study included the distribution of recalcitrant lesions among treatment groups, with adjuvant PDT and XRT patients having larger and older keloids; and variance in follow-up time between treatment groups, largely because CO_2 laser excision with adjuvant XRT is a newer treatment modality first used in 2013. Nevertheless, these preliminary data suggest that CO_2 excision with adjuvant XRT is an evolving and promising treatment for recalcitrant keloids.

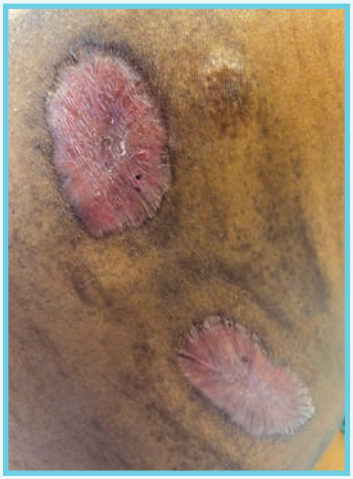
A 46-year-old black female with keloids since adolescence (~30 years) who failed intralesional kenalog, surgical excision, and topical imiquimod was treated with CO_2 laser excision and red light PDT.



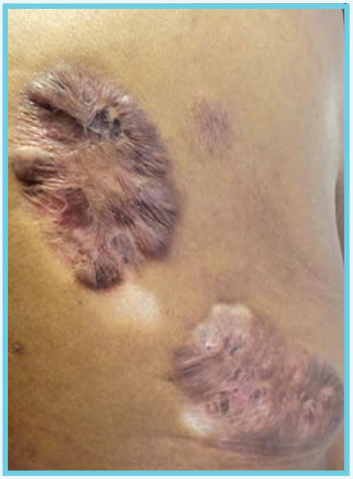
Baseline



Ater CO_2 excision and first PDT treatment

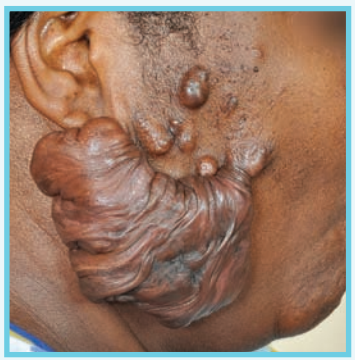


5 month follow-up after third PDT treatment

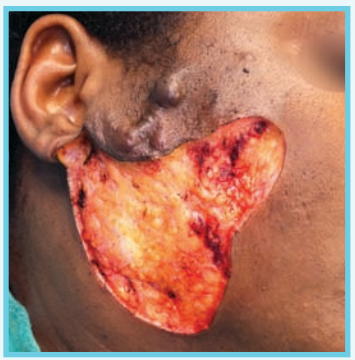


1.5 year follow-up

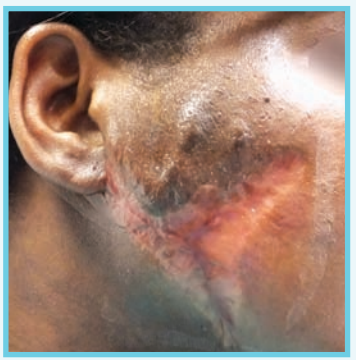
A 44-year-old black female with keloids since pregnancy (20 years) who failed intralesional kenalog and surgical excision was treated with CO_2 laser excision and XRT.



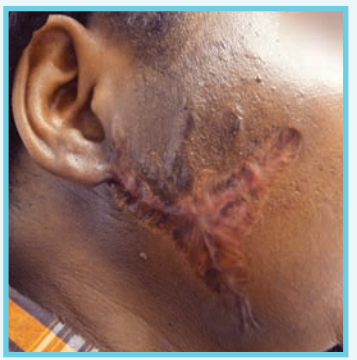
Baseline



Ater CO_2 excision and XRT



4 month follow-up



1 year follow-up

References

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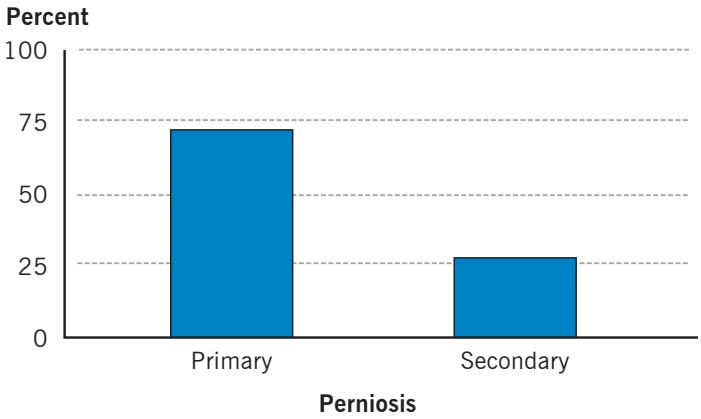
Impact and Associations of Primary and Secondary Perniosis

Perniosis, or chilblains, is a rare vasculitis and is classified as either primary or secondary.[1] The clinical course, associations, and differences between the subtypes of the disease are unknown. The Department of Dermatology retrospectively reviewed 45 patients who met initial diagnostic criteria for perniosis from 2000 to 2016 to compare demographics, comorbidities, disease severity, and response to treatment between primary and secondary types.

Diagnosis of perniosis was made by clinical and histological assessment, and subtype classification was determined with patient history, disease triggers, and comorbid conditions. Forty-four patients were included for analysis, including 32 who presented with primary perniosis and 12 who presented with secondary perniosis.

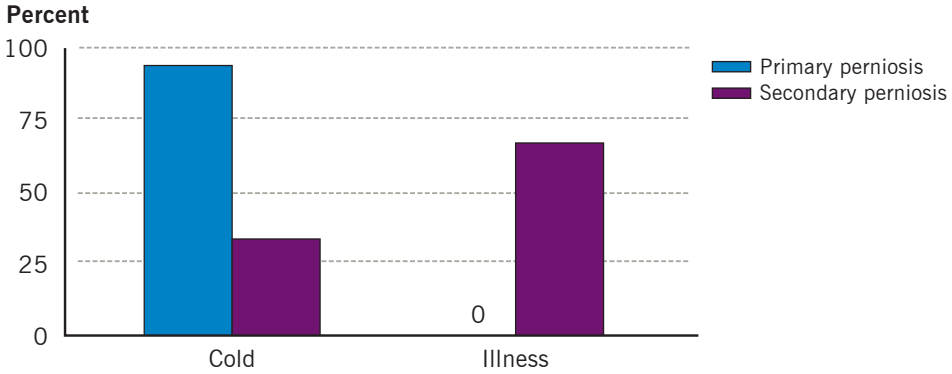
Frequency of Primary vs Secondary Perniosis (N = 44)
2000 – 2016



Primary perniosis was associated with a cold etiology (eg, ski trip, shoveling snow), and secondary perniosis was associated with other illness such as systemic lupus erythematosus or Raynaud syndrome.

Etiology of Primary and Secondary Perniosis (N = 44)

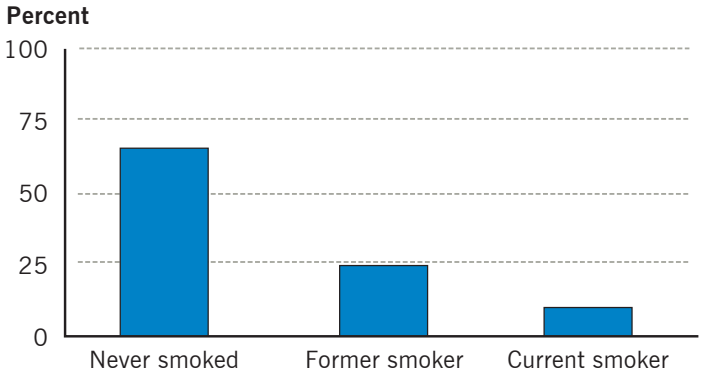
2000 – 2016



Smoking is a known risk factor for vascular endothelial damage and perniosis. Smoking history was available for 40 patients; 26 never smoked, 10 were former smokers, and 4 were current smokers.

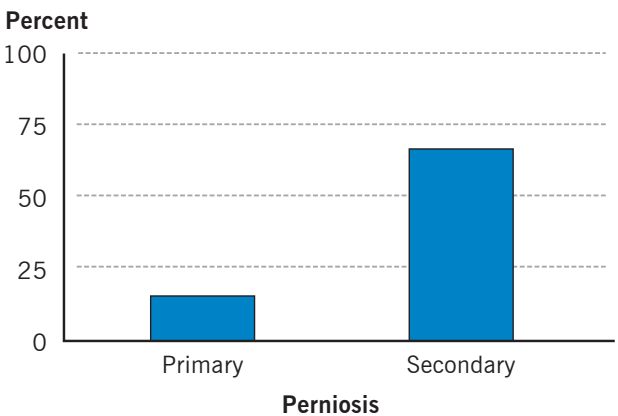
Smoking Status of Perniosis Patients (N = 40)

2000 – 2016

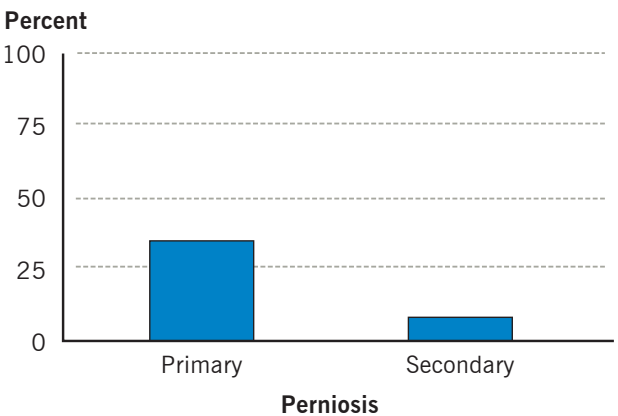


Common comorbid conditions in both groups were vascular disorders, other dermatologic disorders, autoimmune diseases, and mental illnesses. Patients with secondary perniosis tended to have more severe lesions and were more likely to have autoimmune comorbidities while those with primary perniosis tended to have abnormally low hemoglobin levels.

Presence of Autoimmune Comorbidities (N = 44)
2000 – 2016



Presence of Low Hemoglobin Levels (N = 44)
2000 – 2016



Common treatments included corticosteroids, calcium channel blockers, hydroxychloroquine,[2] and other antibiotics. However, the use of hydroxychloroquine and calcium channel blockers were increased in secondary perniosis cases. All patients experienced healing of skin lesions with treatment, with no difference in healing rates between primary and secondary perniosis groups.

Clinical management of perniosis patients should emphasize avoiding triggers such as cold conditions and include clinical and laboratory assessment of vascular disease. Physicians should discuss the clinical course, likelihood of recurrence, and treatments available for perniosis.

References

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Prevalence of Atopic Comorbidities in Eosinophilic Esophagitis

Eosinophilic esophagitis (EoE) is a chronic, immune-mediated esophageal disease characterized by symptoms of esophageal dysfunction with evidence of eosinophil-predominant esophageal inflammation.[1] EoE has been closely linked with a personal and family history of atopic disorders, including asthma, eczema, rhinitis, and food allergies. However, the prevalence of atopic disease in EoE patients varies widely between studies, as estimates have mostly been based on small cohorts.[2-4]

Of 449 Cleveland Clinic patients who presented with clinical and pathological features of EoE who had received an esophageal biopsy from January 2005 to June 2015, 348 (77.5%) had at least 1 atopic disease, 215 (47.9%) had more than 1, and 97 (21.6%) had all 3 atopic diseases. Patients with atopic diseases tended to be younger, more likely to have a family history of atopy, and had significantly higher peripheral eosinophils and serum IgE levels.

Prevalence of Atopy in Eosinophilic Esophagitis (N = 449)

January 2005 – June 2015

Gender, N (%)	
Female	136 (30.3)
Male	313 (69.7)
Age at EoE onset, years	
Mean (SD)	30.52 (17.54)
Race, N (%)	
White	394 (87.8)
Black	26 (5.8)
Asian	6 (1.3)
Multiracial	2 (0.5)
Unknown	21 (4.7)
Atopic disease, N (%)	
At least 1 atopic disease	348 (77.5)
Allergic rhinitis	278 (61.9)
Asthma	175 (39.0)
Atopic dermatitis	207 (46.1)
More than 1 atopic disease	215 (47.9)
Family history of atopy, N (%)	194 (43.2)

EoE = eosinophilic esophagitis

Comparing Eosinophilic Esophagitis Patients With or Without Atopy (N = 449)

January 2005 – June 2015

	No Atopy	Dermatitis	*P* Value	Allergic Rhinitis	*P* Value	Asthma	*P* Value	Any Atopic Diagnosis	*P* Value
Gender, N (%)			0.98[a]		0.42[a]		0.94[a]		0.55[a]
Female	33 (32.7)	68 (32.9)		79 (28.4)		58 (33.1)		103 (29.6)	
Male	68 (67.3)	139 (67.1)		199 (71.6)		117 (66.9)		245 (70.4)	
Race, N (%)			0.53[a]		0.79[a]		0.99[a]		0.85[a]
White	87 (91.6)	182 (89.2)		244 (92.4)		153 (91.6)		307 (92.2)	
Nonwhite	8 (8.4)	22 (10.8)		20 (7.6)		14 (8.4)		26 (7.8)	
Age at EoE diagnosis, years ± SD	36.9 ± 19.0	26.1 ± 17.0	< 0.001[b]	30.2 ± 16.8	0.001[b]	26.0 ± 16.4	< 0.001[b]	28.7 ± 16.7	< 0.001[b]
Family history of atopy, N (%)	17 (16.8)	121 (58.5)	< 0.001[a]	153 (55.0)	< 0.001[c]	97 (55.4)	< 0.001[a]	177 (50.9)	< 0.001[a]
Peripheral eosinophils, median k/uL (25th, 75th percentiles)	0.38 (0.27, 0.60)	0.53 (0.30, 0.80)	0.003[c]	0.49 (0.28, 0.75)	0.021[c]	0.56 (0.37, 0.90)	< 0.001[c]	0.49 (0.30, 0.76)	0.008[c]
Serum IgE, median U/mL (25th, 75th percentiles)	36.5 (6.2, 383.1)	287.5 (65.7, 577.0)	0.014[c]	238.5 (62.8, 611.0)	0.016[c]	341.0 (73.9, 632.0)	0.009[c]	198.5 (58.8, 574.1)	0.024[c]

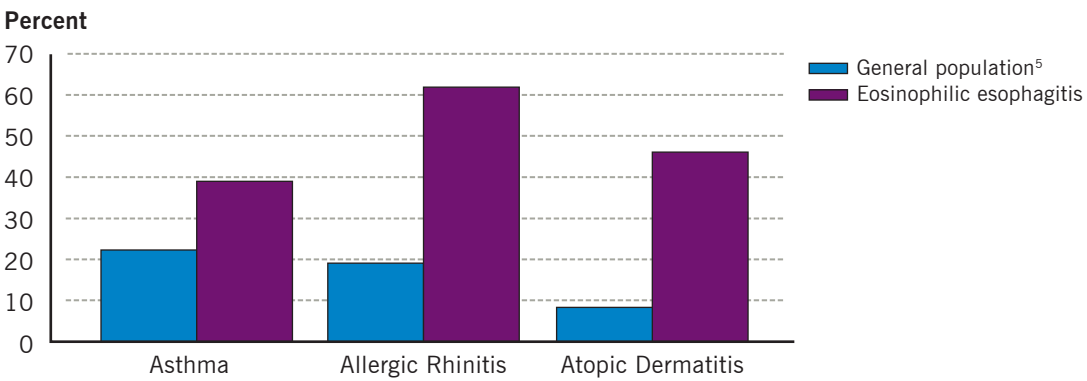
[a]Pearson chi-square test, [b]t-test, [c]Wilcoxon rank sum test

EoE = eosinophilic esophagitis

The prevalence of asthma, allergic rhinitis, and atopic dermatitis in the United States is estimated to be 22.3%, 19.1%, and 8.3%, respectively,[5] but was 39%, 61.9%, and 46.1%, respectively, in this EoE population. The results suggest a strong association between atopic disease and EoE that should prompt vigilance when screening patients with atopic disease or esophageal dysfunction.

Atopic Disease Prevalence: Eosinophilic Esophagitis Patients vs General Population (N = 449)

January 2005 – June 2015



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Trends in Pediatric Patch Testing: A 10-Year Retrospective Review

Allergic contact dermatitis (ACD) has broad differential diagnoses, and patch testing is the gold standard for diagnosing ACD and identifying relevant allergens. However, it is often underused or delayed, with children receiving systemic immunosuppressants instead.

The institute performed a 10-year retrospective chart review of the 157 patients ages 3 to 18 years who underwent patch testing at Cleveland Clinic from 2005 to 2015. Most (N = 112) were referred by dermatologists for suspected ACD. Forty-four patients were referred by a dermatology nurse practitioner, primary care provider, or dermatology physician assistant. One patient did not have a referral role indicated in their chart.

Patch Testing Referrals (N = 156)
2005 – 2015

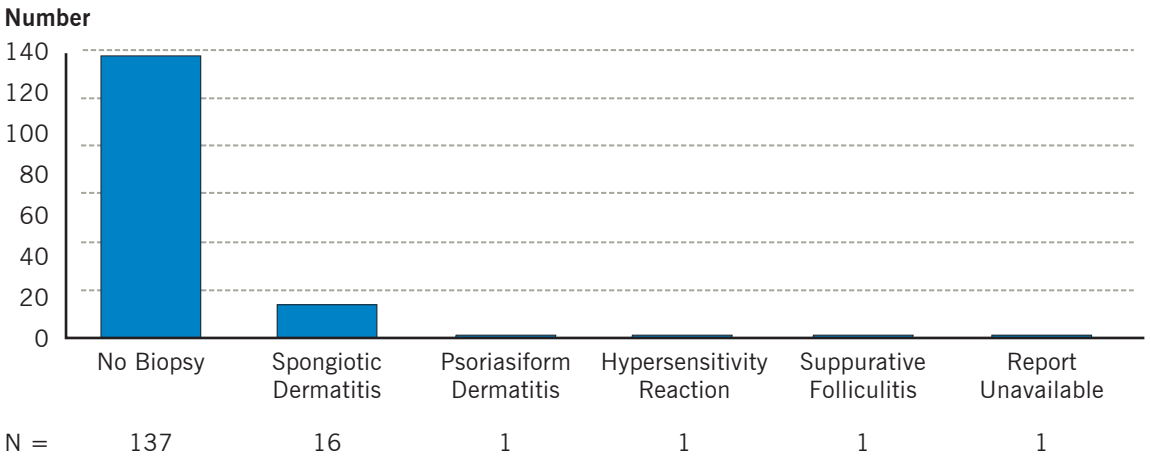
		Referred by Dermatologist (N = 112)		Referred by Others (N = 44)	
	Total	N	Percent	N	Percent
Referral Reason					
Suspected ACD	107	81	72.3	26	59.1
Recalcitrant dermatitis	34	30	26.8	4	9.1
Other	15	1	0.89	14	31.8

ACD = allergic contact dermatitis

Patch testing was performed according to North American Contact Dermatitis Group (NACDG) protocol. Twenty patients had biopsy prior to their patch testing appointments.

Biopsy Results Before Patch Testing (N = 157)

2005 – 2015



Top Cleveland Clinic Cohort Allergens vs the Pediatric NACDG Rate (N = 157)
2005 – 2015

Allergen	Positive Patch Test	N (%)	NACDG Positive Rate	*P* Value[a]
Any positive test	No	38 (25.17)	62.3%	**0.002**
	Yes	113 (74.83)		
Nickel sulfate, 2.5%	No	114 (75.50)	28.1%	0.37
	Yes	37 (24.50)		
Cobalt chloride, 1%	No	119 (78.81)	12.3%	**0.003**
	Yes	32 (21.19)		
Fragrance mix 1, 8%	No	129 (85.43)	5.2%	< **0.001**
	Yes	22 (14.57)		
Neomycin, 20%	No	131 (86.75)	7.1%	**0.011**
	Yes	20 (13.25)		
Bacitracin, 20%	No	137 (90.73)	5.2%	0.053
	Yes	14 (9.27)		
Fragrance mix 2, 14%	No	139 (92.05)	2.1%	< **0.001**
	Yes	12 (7.95)		
Myroxylon pereirae, 25%	No	140 (92.72)	5.7%	0.49
	Yes	11 (7.28)		
Cocamidopropyl betaine, 1%	No	141 (93.38)	1.4%	< **0.001**
	Yes	10 (6.62)		
Potassium dichromate (chrome), 0.25%	No Yes	143 (94.70) 8 (5.30)	2.3%	**0.048**

NACDG = North American Contact Dermatitis Group

[a]Derived from binomial tests

A mean of 59.2 (SD = 24.6) allergens per patient were tested, with 115 (73.25%) patients experiencing at least 1 positive reaction and 86 (54.78%) having 2 or more positive reactions. The most prevalent allergens in this population were nickel and cobalt.

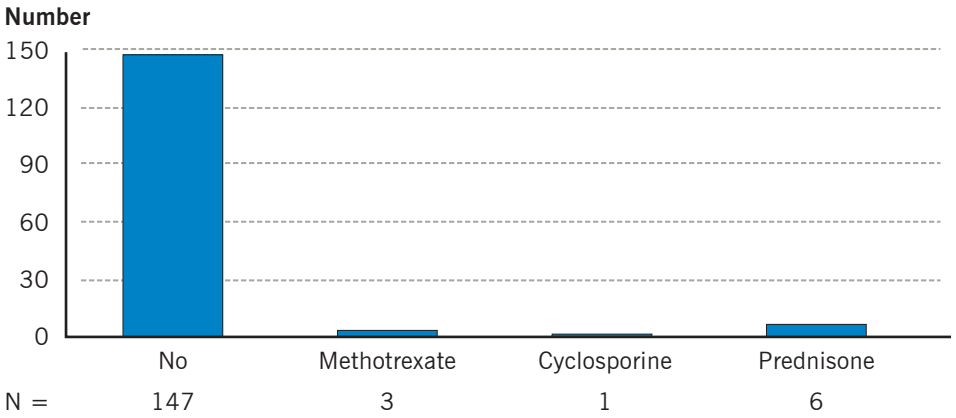
Compared with NACDG allergen rates reported from 2005 to 2012,[1] the overall rate of positive patch tests was higher at Cleveland Clinic ($P = 0.002$); rates of positive cobalt, fragrance mix 1 and 2, neomycin, cocamidopropyl betaine, and chromium tests were also significantly higher.

No significant association was found between age and allergen sensitivity. Males were more likely to have a positive reaction to fragrance mix 1 than females ($P = 0.02$). Those with a history of atopy were more likely to have a positive reaction to cobalt ($P = 0.008$) and chromium ($P = 0.03$).

Of the 60 patients (38.2%) returning for follow-up, 37 (60.7%) reported improvement; most (N = 54 [88.5%]) were being treated with topical corticosteroids. Ten patients were receiving immunosuppressant therapy.

Systemic Immunosuppressive Therapy at Follow-Up (N = 157)

2005 – 2015



These results provide information regarding common allergens in children that can enhance patient care, and show that earlier patch testing can improve quality of life and avoid systemic immunosuppressant use.

Reference

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Teledermatology

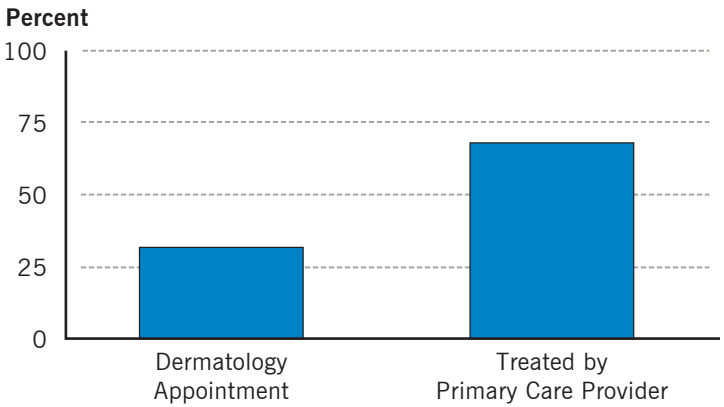
Teledermatology has been shown to reduce outpatient wait times and increase access while decreasing unnecessary office visits.[1,2] In July 2014, the Department of Dermatology launched a teledermatology consult program designed to triage appropriate patients into earlier dermatology appointments, avoid unneeded referrals, and provide informal consultations.

The program has expanded to 5 of Cleveland Clinic's Express Care Clinics, which are predominantly staffed by nurse practitioners and physician assistants. Store-and-forward teledermatology consultations were placed using secure smartphones or tablets designated for this purpose. Patient photos, along with pertinent clinical documentation in the electronic medical record, were reviewed by a dermatology staff member and resident. Triage outcomes were grouped into 2 categories: The treatment plan outlined by the primary care provider was reasonable and a dermatology appointment could be deferred, or a dermatology appointment was required for further evaluation and treatment.

Fewer than one-third (32%) of the consultations required a dermatology appointment. A median of 8 days (interquartile range = 5–28) elapsed between the teledermatology consult and the first appointment offered to the patient. The teledermatology consult program has decreased unnecessary visits, resulted in greater access to dermatologists, and saved patients time, travel, and expense. Plans are being made to expand its availability to an additional 13 regional Cleveland Clinic Express Care Clinics in 2017.

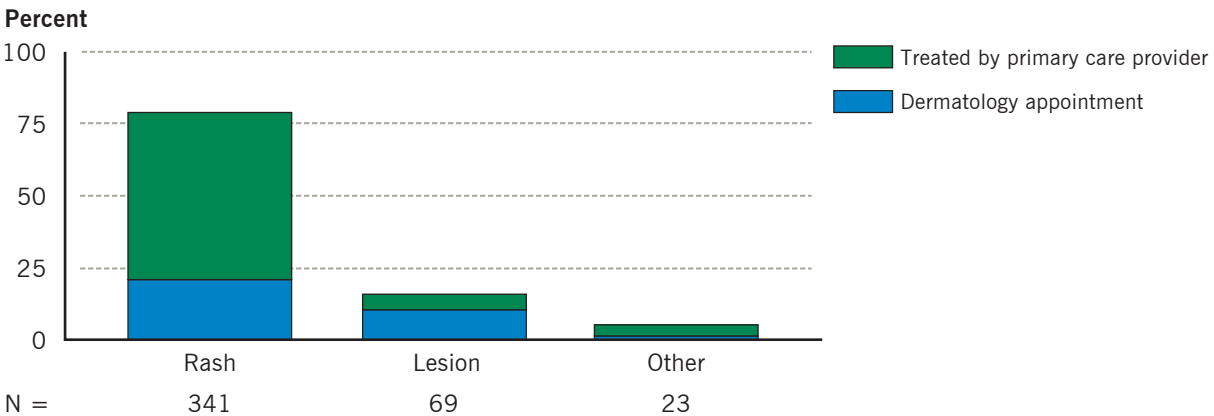
Teledermatology Triage Outcome (N = 433)

July 2014 – December 2016



Reason for Consult and Triage Outcome (N = 433)

July 2014 – December 2016



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Patient Experience – Dermatology & Plastic Surgery Institute

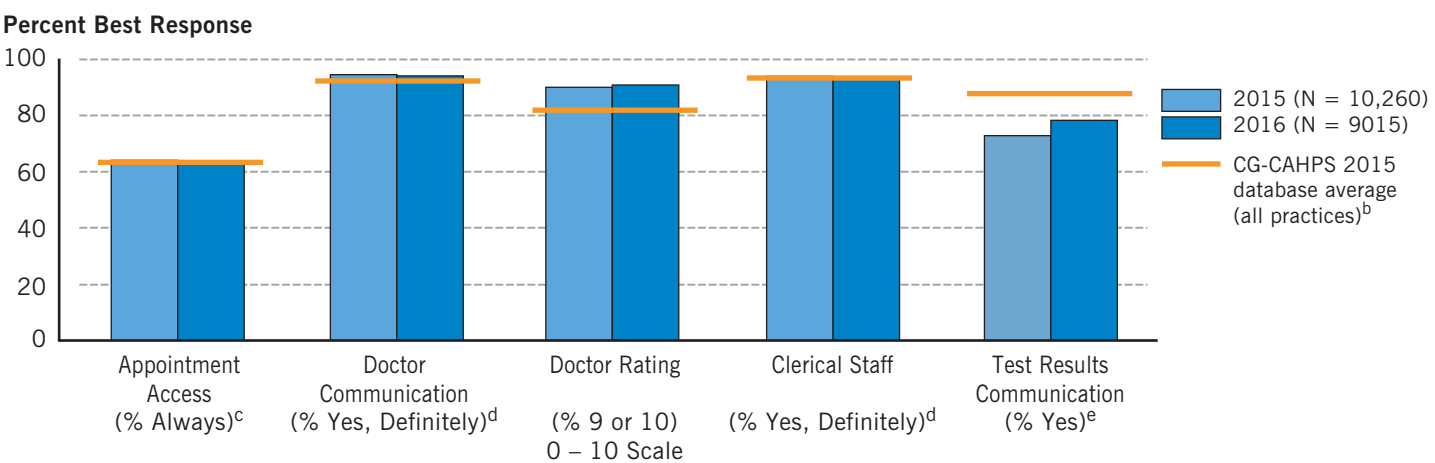
Keeping patients at the center of all that Cleveland Clinic does is critical. Patients First is the guiding principle at Cleveland Clinic. Patients First is safe care, high-quality care, in the context of patient satisfaction, and high value. Ultimately, caregivers have the power to impact every touch point of a patient's journey, including their clinical, physical, and emotional experience.

Cleveland Clinic recognizes that patient experience goes well beyond patient satisfaction surveys. Nonetheless, sharing the survey results with caregivers and the public affords opportunities to improve how Cleveland Clinic delivers exceptional care.

Outpatient Office Visit Survey — Dermatology & Plastic Surgery Institute

CG-CAHPS Assessment[a]

2015 – 2016



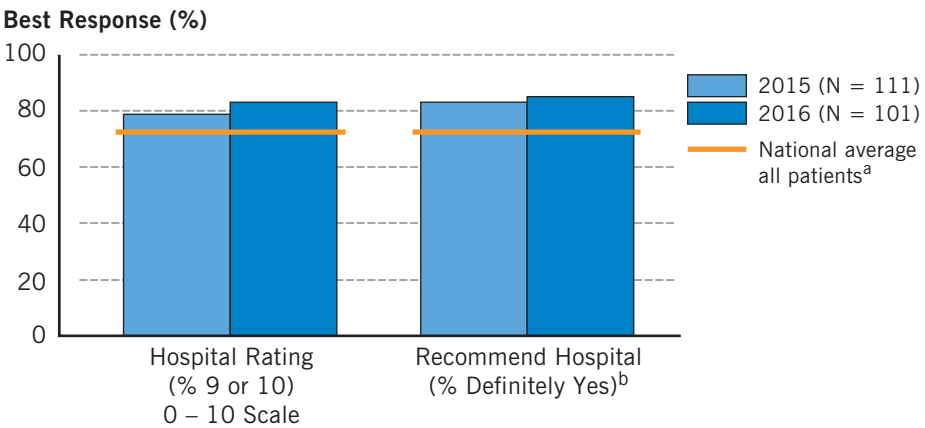
[a]In 2013, Cleveland Clinic began administering the Clinician and Group Practice Consumer Assessment of Healthcare Providers and Systems surveys (CG-CAHPS), standardized instruments developed by the Agency for Healthcare Research and Quality (AHRQ) and supported by the Centers for Medicare & Medicaid Services for use in the physician office setting to measure patients' perspectives of outpatient care.
[b]Based on results submitted to the AHRQ CG-CAHPS database from 2829 practices in 2015
[c]Response options: Always, Usually, Sometimes, Never
[d]Response options: Yes, definitely; Yes, somewhat; No
[e]Response options: Yes, No

Source: Press Ganey, a national hospital survey vendor

Inpatient Survey — Dermatology & Plastic Surgery

HCAHPS Overall Assessment

2015 – 2016

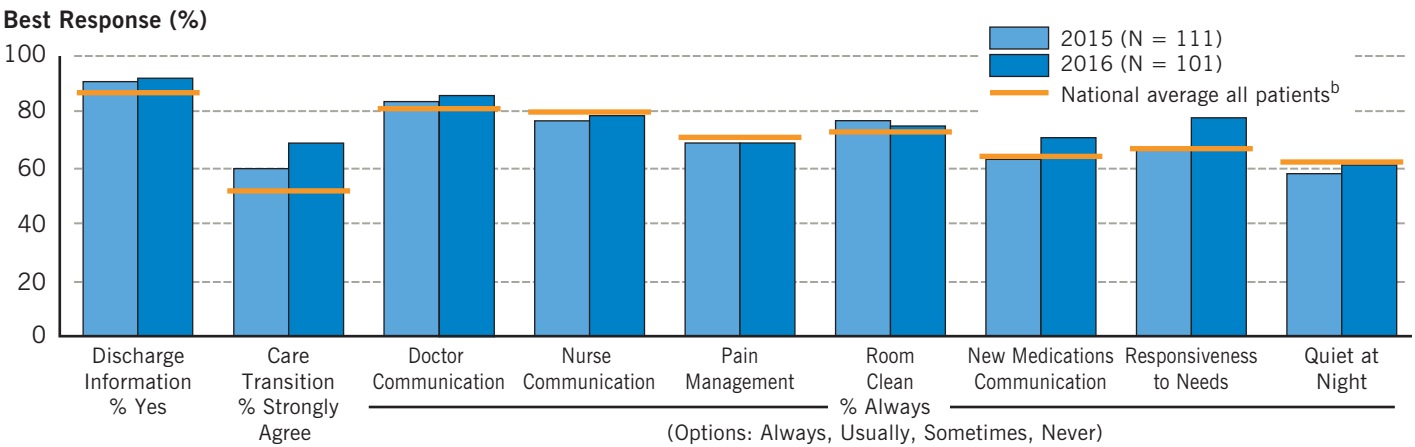


[a]Based on national survey results of discharged patients, January 2015 – December 2015, from 4172 US hospitals. medicare.gov/hospitalcompare
[b]Response options: Definitely yes, Probably yes, Probably no, Definitely no

The Centers for Medicare & Medicaid Services requires United States hospitals that treat Medicare patients to participate in the national Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, a standardized tool that measures patients' perspectives of hospital care. Results collected for public reporting are available at medicare.gov/hospitalcompare.

HCAHPS Domains of Care[a]

2015 – 2016



[a]Except for "Room Clean" and "Quiet at Night," each bar represents a composite score based on responses to multiple survey questions.
[b]Based on national survey results of discharged patients, January 2015 – December 2015, from 4172 US hospitals. medicare.gov/hospitalcompare

Source: Press Ganey, a national hospital survey vendor, 2016

Cleveland Clinic — Implementing Value-Based Care

Overview

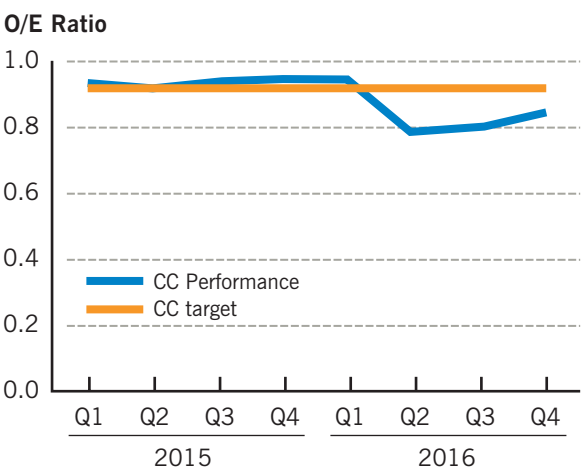
Cleveland Clinic health system uses a systematic approach to performance improvement while simultaneously pursuing 3 goals: improving the patient experience of care (including quality and satisfaction), improving population health, and reducing the cost of healthcare. The following measures are examples of 2016 focus areas in pursuit of this 3-part aim. Throughout this section, "Cleveland Clinic" refers to the academic medical center or "main campus," and those results are shown.

Real-time data are leveraged in each Cleveland Clinic location to drive performance improvement. Although not an exact match to publicly reported data, more timely internal data create transparency at all organizational levels and support improved care in all clinical locations.

Improve the Patient Experience of Care

Cleveland Clinic Overall Mortality Ratio

2015 – 2016

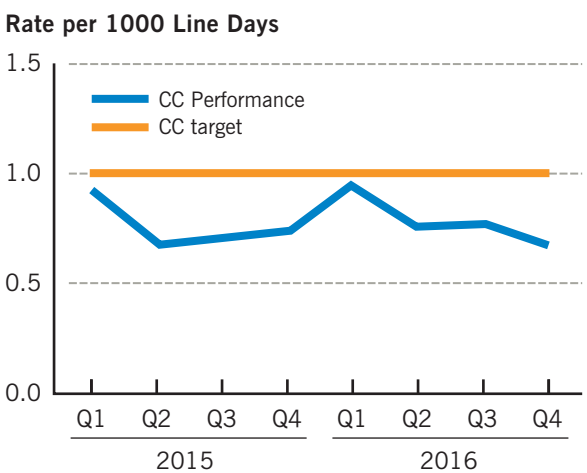


Source: Data from the Vizient Clinical Data Base/Resource Manager™ used by permission of Vizient. All rights reserved.

Cleveland Clinic's observed/expected (O/E) mortality ratio outperformed its internal target derived from the Vizient 2016 risk model. Ratios less than 1.0 indicate mortality performance "better than expected" in Vizient's risk adjustment model.

Cleveland Clinic Central Line-Associated Bloodstream Infection, reported as Standardized Infection Ratio (SIR)

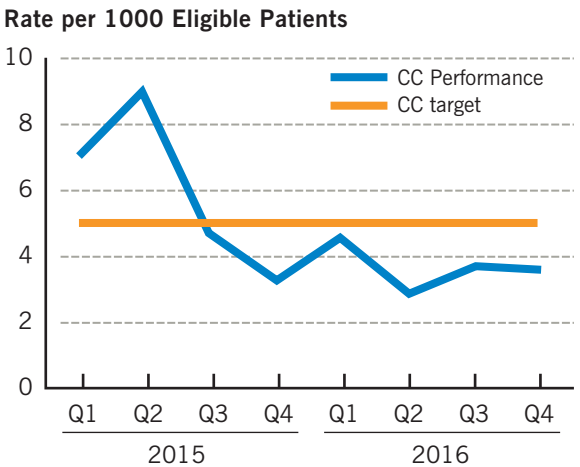
2015 – 2016



Cleveland Clinic has implemented several strategies to reduce central line-associated bloodstream infections (CLABSIs), including a central-line bundle of insertion, maintenance, and removal best practices. Focused reviews of every CLABSI occurrence support reductions in CLABSI rates in the high-risk critical care population.

Cleveland Clinic Postoperative Respiratory Failure Risk-Adjusted Rate

2015 – 2016

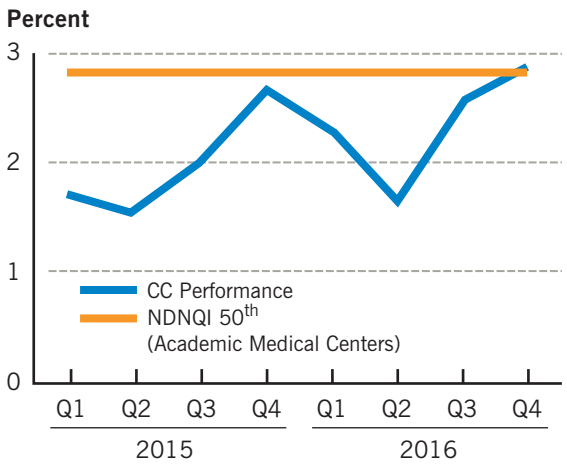


Source: Data from the Vizient Clinical Data Base/Resource Manager™ used by permission of Vizient. All rights reserved.

Efforts continue toward reducing intubation time, assessing readiness for extubation, and preventing the need for reintubation. Cleveland Clinic has leveraged the technology within the electronic medical record to support ongoing improvement efforts in reducing postoperative respiratory failure (AHRQ Patient Safety Indicator 11). Prevention of respiratory failure remains a safety priority for Cleveland Clinic.

Cleveland Clinic Hospital-Acquired Pressure Ulcer Prevalence (Adult)

2015 – 2016



Source: Data reported from the National Database for Nursing Quality Indicators® (NDNQI®) with permission from Press Ganey.

A pressure ulcer is an injury to the skin that can be caused by pressure, moisture, or friction. These sometimes occur when patients have difficulty changing position on their own. Cleveland Clinic caregivers have been trained to provide appropriate skin care and regular repositioning while taking advantage of special devices and mattresses to reduce pressure for high-risk patients. In addition, they actively look for hospital-acquired pressure ulcers and treat them quickly if they occur.

Cleveland Clinic strategies to mitigate the risk of these pressure injuries include routine rounding to accurately stage pressure injuries, monthly multidisciplinary wound care meetings, and ongoing nursing education, both in the classroom and at the bedside.

Cleveland Clinic — Implementing Value-Based Care

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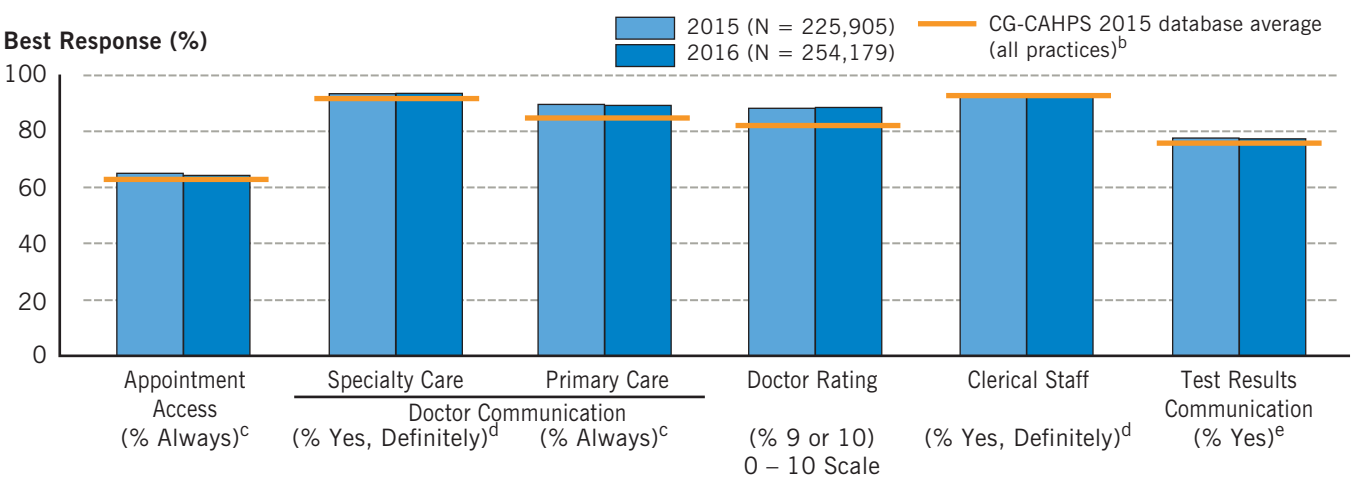
We know that patient experience goes well beyond patient satisfaction surveys. Nonetheless, by sharing the survey results with our caregivers and the public, we constantly identify opportunities to improve how we deliver exceptional care.

Outpatient Office Visit Survey — Cleveland Clinic

CG-CAHPS Assessment[a]

2015 – 2016



[a]In 2013, Cleveland Clinic began administering the Clinician and Group Practice Consumer Assessment of Healthcare Providers and Systems surveys (CG-CAHPS), standardized instruments developed by the Agency for Healthcare Research and Quality (AHRQ) and supported by the Centers for Medicare & Medicaid Services for use in the physician office setting to measure patients' perspectives of outpatient care.
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[d]Response options: Yes, definitely; Yes, somewhat; No
[e]Response options: Yes, No

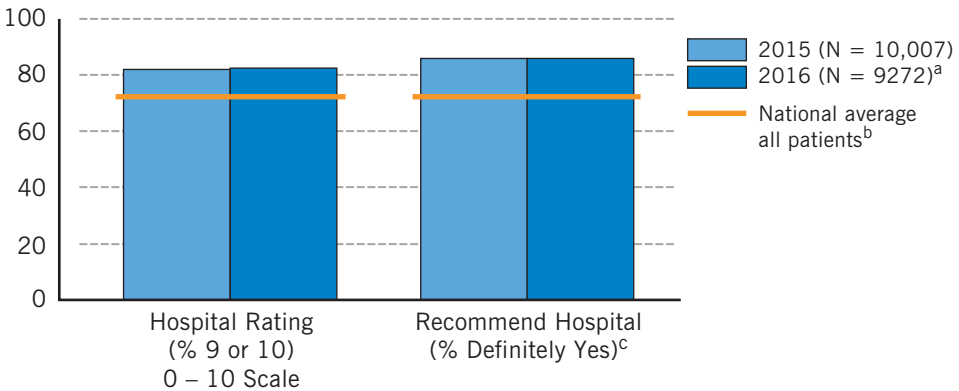
Source: Press Ganey, a national hospital survey vendor

Inpatient Survey — Cleveland Clinic

HCAHPS Overall Assessment

2015 – 2016

Best Response (%)



[a]At the time of publication, 2016 ratings have not been reported by the Centers for Medicare & Medicaid Services and ratings are not adjusted for patient mix.
[b]Based on national survey results of discharged patients, January 2015 – December 2015, from 4172 US hospitals. medicare.gov/hospitalcompare
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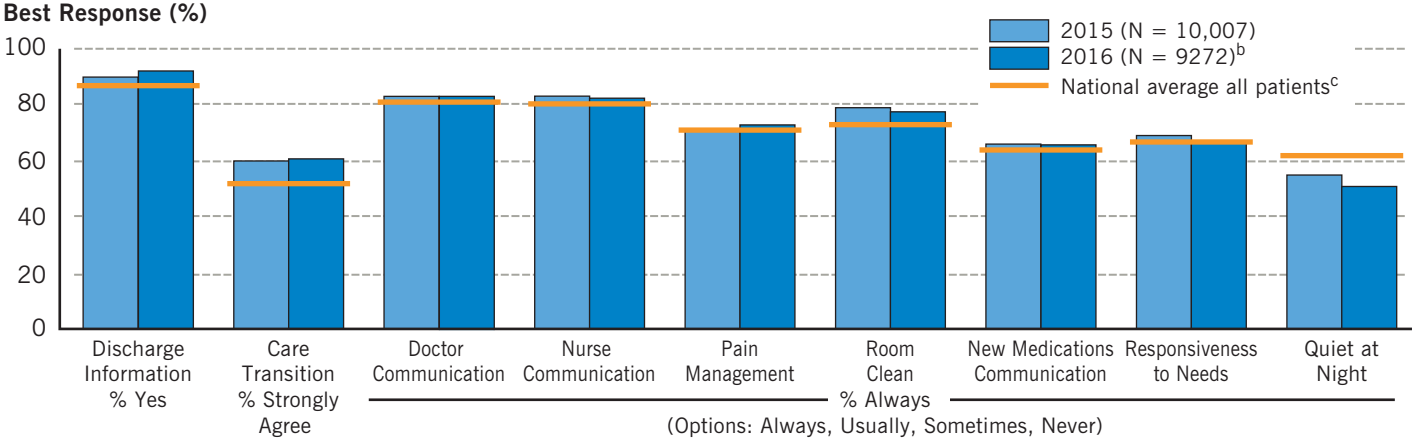
HCAHPS Domains of Care[a]

2015 – 2016

Best Response (%)



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[c]Based on national survey results of discharged patients, January 2015 – December 2015, from 4172 US hospitals. medicare.gov/hospitalcompare

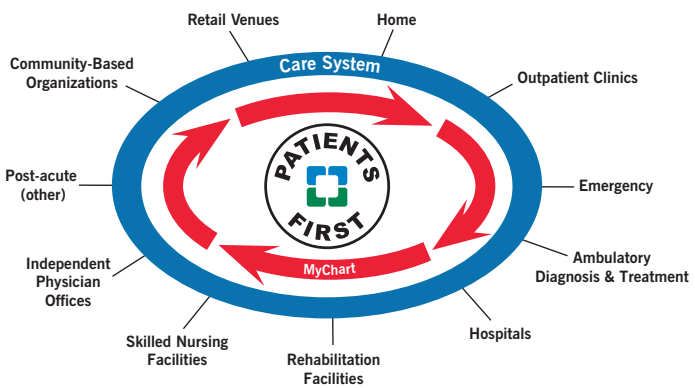
Source: Centers for Medicare & Medicaid Services, 2015; Press Ganey, a national hospital survey vendor, 2016

Focus on Value

Cleveland Clinic has developed and implemented new models of care that focus on "Patients First" and aim to deliver on the Institute of Medicine goal of **S**afe, **T**imely, **E**ffective, **E**fficient, **E**quitable, **P**atient-centered care. Creating new models of Value-Based Care is a strategic priority for Cleveland Clinic. As care delivery shifts from fee-for-service to a population health and bundled payment delivery system, Cleveland Clinic is focused on concurrently improving patient safety, outcomes, and experience.

What does this new model of care look like?

Integrated Care Model



The Cleveland Clinic Integrated Care Model (CCICM) is a value-based model of care, designed to improve outcomes while reducing cost. It is designed to deliver value in both population health and specialty care.

- The patient remains at the heart of the CCICM.
- The blue band represents the care system, which is a seamless pathway that patients move along as they receive care in different settings. The care system represents integration of care across the continuum.
- Critical competencies are required to build this new care system. Cleveland Clinic is creating disease- and condition-specific care paths for a variety of procedures and chronic diseases. Another facet is implementing comprehensive care coordination for high-risk patients to prevent unnecessary hospitalizations and emergency department visits. Efforts include managing transitions in care, optimizing access and flow for patients through the CCICM, and developing novel tactics to engage patients and caregivers in this work.
- Measuring performance around quality, safety, utilization, cost, appropriateness of care, and patient and caregiver experience is an essential component of this work.

Improve Population Health

Cleveland Clinic Accountable Care Organization Measure Performance

2016

National Percentile Ranking

90th	• Falls Screening • Heart Failure • Ischemic Vascular Disease • BMI Screening • Tobacco Screening
80th	• Coronary Artery Disease • Diabetes • Breast Cancer Screening • Pneumonia Vaccination
70th	• Colorectal Cancer Screening • Influenza Vaccination • Blood Pressure Screening • Hypertension
50th	• Depression Screening

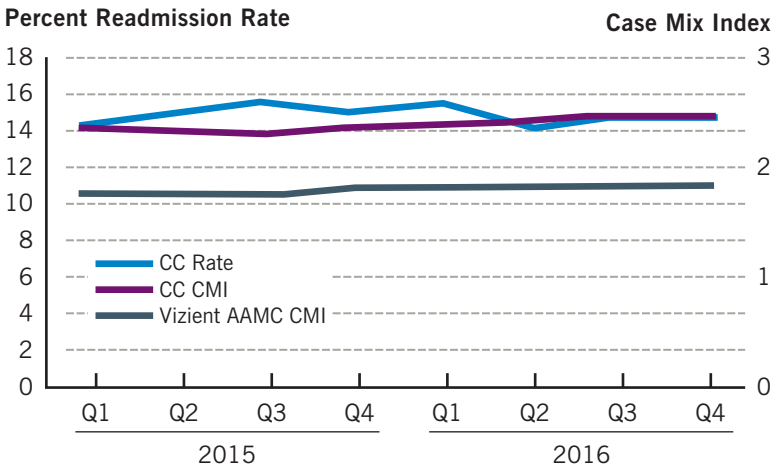
Higher percentiles are better

As part of Cleveland Clinic's commitment to population health and in support of its Accountable Care Organization (ACO), these ACO measures have been prioritized for monitoring and improvement. Cleveland Clinic is improving performance in these measures by enhancing care coordination, optimizing technology and information systems, and engaging primary care specialty teams directly in the improvement work. These pursuits are part of Cleveland Clinic's overall strategy to transform care in order to improve health and make care more affordable.

Reduce the Cost of Care

Cleveland Clinic All-Cause 30-Day Readmission Rate to Any Cleveland Clinic Hospital

2015 – 2016

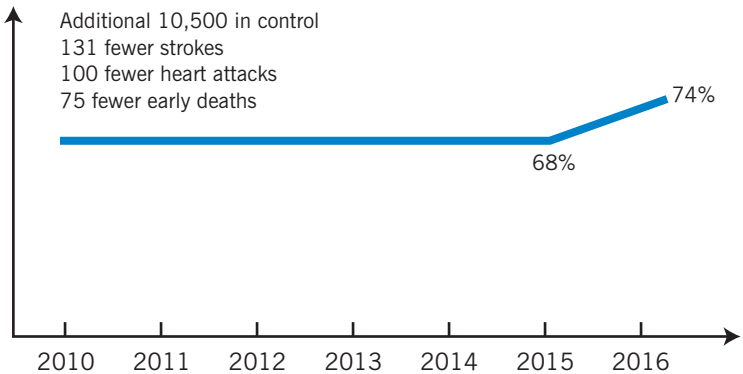


CMI = case mix index

Source: Data from the Vizient Clinical Data Base/Resource Manager™ used by permission of Vizient. All rights reserved.

Cleveland Clinic monitors 30-day readmission rates for any reason to any of its system hospitals. Unplanned readmissions are actively reviewed for improvement opportunities. Comprehensive care coordination and care management for high-risk patients has been initiated in an effort to prevent unnecessary hospitalizations and emergency department visits. Sicker, more complex patients are more susceptible to readmission. Case mix index (CMI) reflects patient severity of illness and resource utilization. Cleveland Clinic's CMI remains one of the highest among American academic medical centers.

Accountable Care Organization (ACO) Improving Outcomes and Reducing Costs



Cleveland Clinic was one of the top performing new ACOs in the United States (for 2015 performance as determined in 2016) due to efficiency, cost reduction, and improvements in effectiveness of chronic disease management such as treating hypertension, reducing preventable hospitalizations through care coordination, and optimizing the care at skilled nursing facilities through its Connected Care program.

For example, a system-wide effort to improve the control of blood pressure for patients with hypertension was begun in 2016 and resulted in an additional 10,500 patients with blood pressure controlled. This will translate to many fewer strokes, heart attacks, and preventable deaths.

Sleep Apnea Treatment

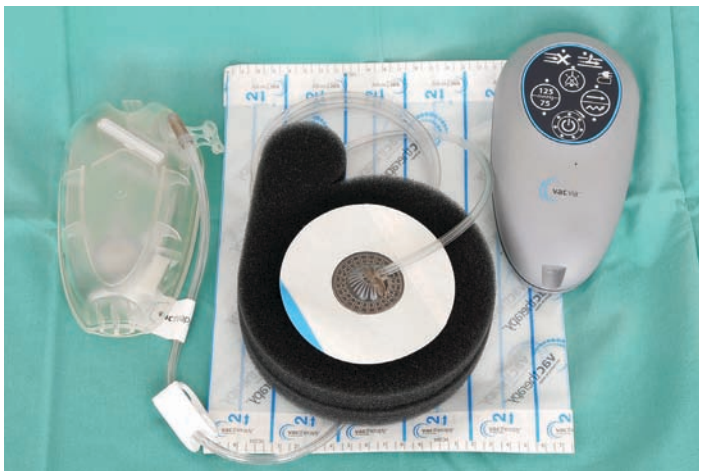
Cleveland Clinic researchers have developed a fundamentally different approach to obstructive sleep apnea treatment that aims to be better tolerated than current therapies such as continuous positive airway pressure, potentially increasing patient compliance and improving outcomes.

The institute has studied transmandibular neurostimulation that specifically stimulates isolated anterior glossal extrinsic muscles innervated by the branches of the hypoglossal motor nerve. Once stimulated, these anterior tongue muscles pull the posterior tongue base forward, thereby relieving airway obstruction just above the larynx and epiglottis. The next step is to develop clinically representative components for an implantable stimulator system for long-term use. The device will be embedded subcutaneously in the lower jaw through a minimally invasive procedure with relatively low potential for any postoperative morbidity. The stimulator will be externally activated and powered, obviating the need for an implantable battery or self-contained power source, which is a compelling advantage over existing implantable hypoglossal nerve stimulators.

Vacuum-Assisted Closure Drug Delivery System for Chronic Wounds

The Department of Plastic Surgery has developed and clinically studied a prototype of the Ion-Vac system for fast and efficient wound healing. The technology consists of negative pressure wound therapy and iontophoretic pulsed drug delivery that efficiently transfers stable silver ions combined with other compounds developed at Cleveland Clinic through the biofilm to achieve wound decontamination and healing. The institute has demonstrated that this combined approach simultaneously eliminates bacterial contamination from the wound surface to ward off infection, accelerates wound healing time, and reduces dressing changes, thereby lowering treatment cost.

The next generation device will integrate a flexible biosensor system with an alarm to monitor wound healing and dressing changes. This integrated device will reduce the bacterial load on the patient while simultaneously debriding the wound and inducing wound healing growth factors, resulting in accelerated wound healing.



The Ion-Vac system uses foam saturated with silver dihydrogen hydrogel and a compressible electrode connected via suction tubes to an external vacuum pump, power source, and monitoring hardware. Negative pressure removes debris and accelerates healing with macro and micro mechanical tension across the wound bed. Wound debris is collected in the waste container by vacuum force.

Collaborative Holographic Surgical Planning Platform

Holographic surgical planning applications that allow sharing measurements, annotations, and other information across surgical locations and stages hold promise for facilitating surgical collaboration. Further combining an augmented reality (AR) system with telementoring functions can allow the shared surgical planning information to be superimposed directly onto the surgical field or patient.[1,2] The resulting combination can benefit the planning, teaching, simulation, and implementation of complex surgical procedures, with the potential to increase planning accuracy and decrease planning time.

The Department of Plastic Surgery, together with the Cleveland Clinic Lerner Research Institute's Department of Biomedical Engineering, has developed a preliminary holographic craniofacial surgical planning application for planning, intraoperative guidance and navigation, and education. The platform is based on a wide range of existing AR capabilities and prototypes, as well as surgical algorithms, techniques, and tools. The platform incorporates WiFi, holographic processing, inertial measurement units processing, web server, video camera, microphone, speaker, and depth sensor capabilities. Scripts to efficiently convert medical image data to holograms have also been developed. Using initial prototype applications, surgeons from a range of specialties found the platform very useful for reviewing holograms of craniofacial and other structures/tissues in the simulated preoperative planning stage.

References

1. Vera AM, Russo M, Mohsin A, Tsuda S. Augmented reality telementoring (ART) platform: a randomized controlled trial to assess the efficacy of a new surgical education technology. *Surg Endosc.* 2014 Dec;28(12):3467-3472.
2. Profeta AC, Schilling C, McGurk M. Augmented reality visualization in head and neck surgery: an overview of recent findings in sentinel node biopsy and future perspectives. *Br J Oral Maxillofac Surg*. 2016 Jul;54(6):694-696.

Integrated Image Fluorescence Guided Surgery

Sentinel lymph node biopsy is the standard staging technique for breast cancer and melanoma. In clinical settings, radionuclides and blue dye are often used together for lymph node mapping. Unfortunately, radionuclides involve ionizing radiation and pose risks for patients and clinicians, and the contrast for visualization is usually low.

To overcome these challenges, the institute has developed a wearable intraoperative imaging and display system. Unlike conventional instruments that rely on external computer monitors, the integrated imaging goggle simulates natural binocular vision and offers line-of-sight stereoscopic imaging with depth perception. Unlike gamma probes that have no imaging capability and use ionizing radiation, the goggle accurately and safely produces high resolution lesion images. The device also offers concurrent wide-field fluorescence imaging and handheld microscopy, allowing surgeons to quickly survey the entire surgical field and suspicious areas in detail. Macro- and microscopic target features can be imaged simultaneously for accurate determination of surgical margin and small lesion status.

The goggle has shown potential for better surgical outcomes and lower treatment cost, and is easily applied in various surgical oncology procedures including lymph node mapping. A clinical trial in breast cancer is currently underway.

Photodynamic Therapy/Noninvasive Cutaneous Oncology Clinic

The Department of Dermatology has initiated a comprehensive photodynamic therapy/noninvasive cutaneous oncology clinic at the main campus offering consultations and noninvasive treatment options for actinic keratoses and certain nonmelanoma skin cancers. Photodynamic therapy (PDT) is an increasingly popular alternative to liquid nitrogen cryotherapy or 5-fluorouracil for widespread actinic keratoses of the face, scalp, and extremities.

Services include Cleveland Clinic's painless PDT regimen combined with short courses of 5-fluorouracil or vitamin D. In a recently completed clinical trial, Cleveland Clinic researchers found that blue light PDT administered immediately following photosensitizer application results in the same erythema and lesion clearing as traditional PDT, but without pain during illumination.

The new clinic will offer teledermatology follow-ups as a standard option for patients, and information on active clinical trials, including PDT for Gorlin-Goltz syndrome or multiple basal cell carcinomas, will be available.

Contact Information

General Dermatology Appointments/Referrals

216.444.5725 or 800.223.2273, ext. 45725

Surgical Dermatology Appointments/Referrals

216.444.5724 or 800.223.2273, ext. 45724

Cutaneous Care Center

216.444.2649 or 800.223.2273, ext. 42649

Dermatology Clinical Research

216.445.3157 or 800.223.2273, ext. 53157

Dermatology Financial Counselor

216.445.8662 or 800.223.2273, ext. 58662

Plastic Surgery Appointments/Referrals

216.444.6900 or 800.223.2273, ext. 46900

Plastic Surgery Financial Counselor

216.445.1331 or 800.223.2273, ext. 51331

On the Web at clevelandclinic.org/dermatology and clevelandclinic.org/plastics

Staff Listing

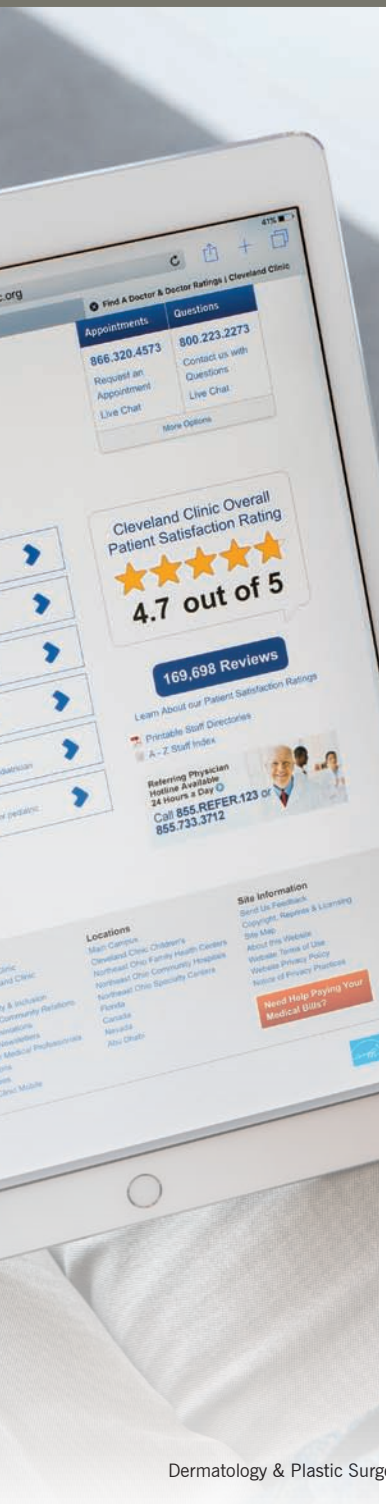
For a complete listing of Cleveland Clinic's Dermatology & Plastic Surgery Institute staff, please visit clevelandclinic.org/staff.

Publications

Dermatology & Plastic Surgery Institute staff authored ***42*** publications in 2016 as indexed within Web of Science.

Locations

For a complete listing of Dermatology & Plastic Surgery Institute locations, please visit clevelandclinic.org/DPSI.



Additional Contact Information

General Patient Referral

24/7 hospital transfers or physician consults

800.553.5056

General Information

216.444.2200

Hospital Patient Information

216.444.2000

General Patient Appointments

216.444.2273 or 800.223.2273

Referring Physician Center and Hotline

855.REFER.123 (855.733.3712)

Or email refdr@ccf.org or visit clevelandclinic.org/refer123

Request for Medical Records

216.444.2640 or
800.223.2273, ext. 42640

Same-Day Appointments

216.444.CARE (2273)

Global Patient Services/ International Center

Complimentary assistance for international patients and families

001.216.444.8184 or visit clevelandclinic.org/gps

Medical Concierge

Complimentary assistance for out-of-state patients and families

800.223.2273, ext. 55580, or email medicalconcierge@ccf.org

Cleveland Clinic Abu Dhabi

clevelandclinicabudhabi.ae

Cleveland Clinic Canada

888.507.6885

Cleveland Clinic Florida

866.293.7866

Cleveland Clinic Nevada

702.483.6000

For address corrections or changes, please call

800.890.2467

About Cleveland Clinic

Overview

Cleveland Clinic is an academic medical center offering patient care services supported by research and education in a nonprofit group practice setting. More than 3500 Cleveland Clinic staff physicians and scientists in 140 medical specialties and subspecialties care for more than 7.1 million patients across the system annually, performing nearly 208,000 surgeries and conducting more than 652,000 emergency department visits. Patients come to Cleveland Clinic from all 50 states and 185 nations. Cleveland Clinic's CMS case-mix index is the second-highest in the nation.

Cleveland Clinic is an integrated healthcare delivery system with local, national, and international reach. The main campus in midtown Cleveland, Ohio, has a 1400-bed hospital, outpatient clinic, specialty institutes, labs, classrooms, and research facilities in 44 buildings on 167 acres. Cleveland Clinic has more than 150 northern Ohio outpatient locations, including 10 regional hospitals, 18 full-service family health centers, 3 health and wellness centers, an affiliate hospital, and a rehabilitation hospital for children. Cleveland Clinic also includes Cleveland Clinic Florida; Cleveland Clinic Nevada; Cleveland Clinic Canada; Cleveland Clinic Abu Dhabi, UAE; Sheikh Khalifa Medical City (management contract), UAE; and Cleveland Clinic London (opening in 2020). Cleveland Clinic is the largest employer in Ohio, with more than 51,000 employees. It generates $12.6 billion of economic activity a year.

Cleveland Clinic supports physician education, training, consulting, and patient services around the world through representatives in the Dominican Republic, Guatemala, India, Panama, Peru, Saudi Arabia, and the United Arab Emirates. Dedicated Global Patient Services offices are located at Cleveland Clinic's main campus, Cleveland Clinic Abu Dhabi, Cleveland Clinic Canada, and Cleveland Clinic Florida.

The Cleveland Clinic Model

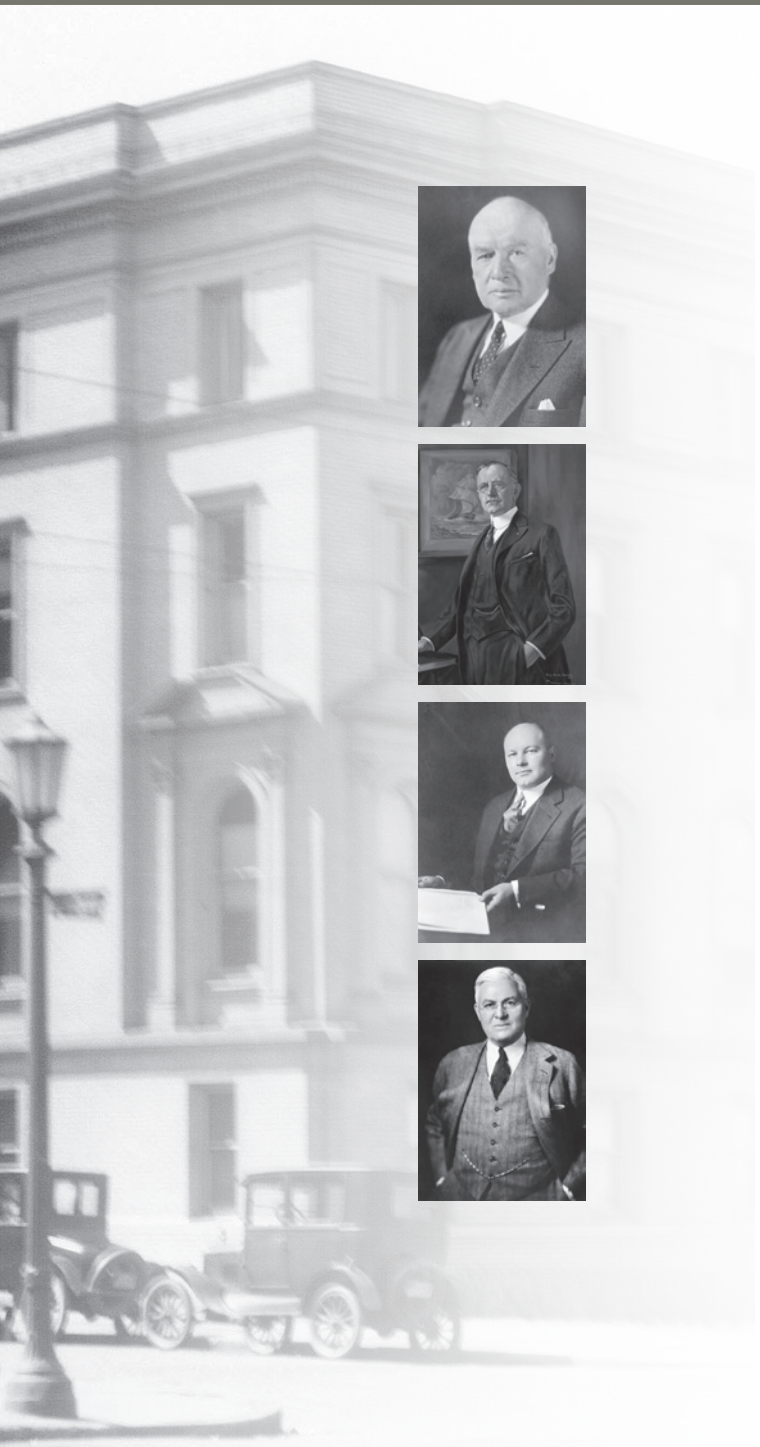
Cleveland Clinic was founded in 1921 by 4 physicians who had served in World War I and hoped to replicate the organizational efficiency of military medicine. The organization has grown through the years by adhering to the nonprofit, multispecialty group practice they established. All Cleveland Clinic staff physicians receive a straight salary with no bonuses or other financial incentives. The hospital and physicians share a financial interest in controlling costs, and profits are reinvested in research and education.

Cleveland Clinic Florida was established in 1987. Cleveland Clinic began opening family health centers in surrounding communities in the 1990s. Marymount Hospital joined Cleveland Clinic in 1995, followed by regional hospitals including Euclid Hospital, Fairview Hospital, Hillcrest Hospital, Lutheran Hospital, Medina Hospital, South Pointe Hospital, and affiliate Ashtabula County Medical Center. In 2015, the Akron General Health System joined the Cleveland Clinic health system.

Internally, Cleveland Clinic services are organized into patient-centered integrated practice units called institutes, each institute combining medical and surgical care for a specific disease or body system. Cleveland Clinic was among the first academic medical centers to establish an Office of Patient Experience, to promote comfort, courtesy, and empathy across all patient care services.

A Clinically Integrated Network

Cleveland Clinic is committed to providing value-based care, and it has grown the Cleveland Clinic Quality Alliance into the nation's second-largest, and northeast Ohio's largest, clinically integrated network. The network comprises more than 6300 physician members, including both Cleveland Clinic staff and independent physicians from the community. Led by its physician members, the Quality Alliance strives to improve quality and consistency of care; reduce costs and increase efficiency; and provide access to expertise, data, and experience.



Cleveland Clinic Lerner College of Medicine

Lerner College of Medicine is known for its small class sizes, unique curriculum, and full-tuition scholarships for all students. Each new class accepts 32 students who are preparing to be physician investigators. In 2015, Cleveland Clinic broke ground on a 477,000-square-foot multidisciplinary Health Education Campus. The campus, which will open in July 2019, will serve as the new home of the Case Western Reserve University (CWRU) School of Medicine and Cleveland Clinic's Lerner College of Medicine, as well as the CWRU School of Dental Medicine, the Frances Payne Bolton School of Nursing, and physician assistant and allied health training programs.

Graduate Medical Education

In 2016, nearly 2000 residents and fellows trained at Cleveland Clinic and Cleveland Clinic Florida in our continually growing programs.

U.S. News & World Report Ranking

Cleveland Clinic is ranked the No. 2 hospital in America by *U.S. News & World Report* (2016). It has ranked No. 1 in heart care and heart surgery since 1995. In 2016, 3 of its programs were ranked No. 2 in the nation: gastroenterology and GI surgery, nephrology, and urology. Ranked among the nation's top five were gynecology, orthopaedics, rheumatology, pulmonology, and diabetes and endocrinology.

Cleveland Clinic Physician Ratings

Cleveland Clinic believes in transparency and in the positive influence of the physician-patient relationship on healthcare outcomes. To continue to meet the highest standards of patient satisfaction, Cleveland Clinic physician ratings, based on nationally recognized Press Ganey patient satisfaction surveys, are published online at clevelandclinic.org/staff.

Resources

Referring Physician Center and Hotline

Call us 24/7 for access to medical services or to schedule patient appointments at 855.REFER.123 (855.733.3712), email refdr@ccf.org, or go to clevelandclinic.org/Refer123. The free Cleveland Clinic Physician Referral App, available for mobile devices, gives you 1-click access. Available in the App Store or Google Play.

Remote Consults

Anybody anywhere can get an online second opinion from a Cleveland Clinic specialist through our MyConsult service. For more information, go to clevelandclinic.org/myconsult, email myconsult@ccf.org, or call 800.223.2273, ext. 43223.

Request Medical Records

216.444.2640 or 800.223.2273, ext. 42640

Track Your Patients' Care Online

Cleveland Clinic offers an array of secure online services that allow referring physicians to monitor their patients' treatment while under Cleveland Clinic care and gives them access to test results, medications, and treatment plans. my.clevelandclinic.org/online-services

Dr**Connect** (online access to patients' treatment progress while under referred care): call 877.224.7367, email drconnect@ccf.org, or visit clevelandclinic.org/drconnect.

MyPractice Community (affordable electronic medical records system for physicians in private practice): 216.448.4617.

eRadiology (teleradiology consultation provided nationwide by board-certified radiologists with specialty training, within 24 hours or stat): call 216.986.2915 or email starimaging@ccf.org.

Medical Records Online

Patients can view portions of their medical record, receive diagnostic images and test results, make appointments, and renew prescriptions through My**Chart**, a secure online portal. All new Cleveland Clinic patients are automatically registered for My**Chart**. clevelandclinic.org/mychart

Access

Cleveland Clinic is committed to convenient access, offering virtual visits, shared medical appointments, and walk-in urgent care for your patients. clevelandclinic.org/access

Critical Care Transport Worldwide

Cleveland Clinic's fleet of ground and air transport vehicles is ready to transfer patients at any level of acuity anywhere on Earth. Specially trained crews provide Cleveland Clinic care protocols from first contact. To arrange a transfer for STEMI (ST-elevation myocardial infarction), acute stroke, ICH (intracerebral hemorrhage), SAH (subarachnoid hemorrhage), or aortic syndrome, call 877.379.CODE (2633). For all other critical care transfers, call 216.444.8302 or 800.553.5056.

CME Opportunities: Live and Online

Cleveland Clinic's Center for Continuing Education operates the largest CME program in the country. Live courses are offered in Cleveland and cities around the nation and the world. The center's website (ccfcme.org) is an educational resource for healthcare providers and the public. It has a calendar of upcoming courses, online programs on topics in 30 areas, and the award-winning virtual textbook of medicine, The Disease Management Project.

Clinical Trials

Cleveland Clinic is running more than 2200 clinical trials at any given time for conditions including breast and liver cancer, coronary artery disease, heart failure, epilepsy, Parkinson disease, chronic obstructive pulmonary disease, asthma, high blood pressure, diabetes, depression, and eating disorders. Cancer Clinical Trials is a mobile app that provides information on the more than 200 active clinical trials available to cancer patients at Cleveland Clinic. clevelandclinic.org/cancertrialapp

Healthcare Executive Education

Cleveland Clinic has programs to share its expertise in operating a successful major medical center. The Executive Visitors' Program is an intensive, 3-day behind-the-scenes view of the Cleveland Clinic organization for the busy executive. The Samson Global Leadership Academy is a 2-week immersion in challenges of leadership, management, and innovation taught by Cleveland Clinic leaders, administrators, and clinicians. Curriculum includes coaching and a personalized 3-year leadership development plan. clevelandclinic.org/executiveeducation

Consult QD Physician Blog

A website from Cleveland Clinic for physicians and healthcare professionals. Discover the latest research insights, innovations, treatment trends, and more for all specialties. consultqd.clevelandclinic.org

Social Media

Cleveland Clinic uses social media to help caregivers everywhere provide better patient care. Millions of people currently like, friend, or link to Cleveland Clinic social media — including leaders in medicine.

Facebook for Medical Professionals
facebook.com/CMEclevelandclinic

Follow us on Twitter
@cleclinicMD

Connect with us on LinkedIn
clevelandclinic.org/MDlinkedin

Cleveland Clinic

Every life deserves world class care.

This project would not have been possible without the commitment and expertise of a team led by James S. Taylor, MD, Jennifer Lucas, MD, Barbara S. Leslie, Nancy F. Toll, Maude L. Campbell, and Kimberly A. Brej.

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