January 5, 2018

Zacks Small-Cap Research

Brian Marckx, CFA
bmarckx@zacks.com
Ph (312) 265-9474

scr.zacks.com
10 S. Riverside Plaza, Chicago, IL 60606

SANUWAVE Health (SNWV-OTC)

SNWV: Moving Price Target to $0.55/Share on FDA Approval

With the updates to our model, we have SNWV generating approximately $22M (when including JV revenue – which on GAAP basis will be accounted for as a component in equity interest calculation) in revenue in 2020 - based on the SNN comp 2020 3.5x P/S multiple, this values SNWV at about $0.55/share

Current Price (01/05/18)	$0.22
Valuation	**$0.55**

OUTLOOK

It was a long time coming but U.S. regulatory marketing clearance of dermaPACE finally came on December 28, 2017 with FDA's classification of SNWV's flagship product as a Class II device under the (now new) generic classification name, "extracorporeal shock wave device for the treatment of chronic wounds".

While FDA approval answered the most important question (i.e. will dermaPACE be allowed to be marketed in the U.S.?), it elicits a lot more – many of which will take time to answer. We hit the highlights (in no particular order) below and hope to know more about each topic (as well as likely other topics) as time passes and SNWV progresses along its U.S. commercialization journey – so stay tuned for future updates.

We approached modeling two different ways, one based on market penetration and the other based on unit placements. Our model incorporates three cases; conservative, base and liberal – which are based on assumed margin (to SNWV), market opportunity, unit placements rate and number of treatments per console. Our model update as a result of FDA approval moves our price target to $0.55/share

SUMMARY DATA

52-Week High	**$0.28**
52-Week Low	**$0.08**
One-Year Return (%)	**23.60**
Beta	**-0.19**
Average Daily Volume (sh)	**305,476**
Shares Outstanding (mil)	**139**
Market Capitalization ($mil)	**$30**
Short Interest Ratio (days)	**N/A**
Institutional Ownership (%)	**0**
Insider Ownership (%)	**23**
Annual Cash Dividend	**$0.00**
Dividend Yield (%)	**0.00**
5-Yr. Historical Growth Rates	
Sales (%)	**13.0**
Earnings Per Share (%)	**N/A**
Dividend (%)	**N/A**
P/E using TTM EPS	**N/A**
P/E using 2017 Estimate	**N/A**
P/E using 2018 Estimate	**N/A**
Zacks Rank	**N/A**

Risk Level	**High,**
Type of Stock	**N/A**
Industry	**Med Products**

ZACKS ESTIMATES

Revenue
(in 000s of $)

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2016	269 A	203 A	256 A	648 A	1,376 A
2017	150 A	111 A	162 A	252 E	584 E
2018					3,496 E
2019					9,726 E

Earnings per Share

	Q1 (Mar)	Q2 (Jun)	Q3 (Sep)	Q4 (Dec)	Year (Dec)
2016	-$0.02 A	-$0.01 A	-$0.01 A	-$0.02 A	-$0.06 A
2017	-$0.00 A	-$0.01 A	-$0.01 A	-$0.01 E	-$0.03 E
2018					-$0.02 E
2019					-$0.02 E

Zacks Projected EPS Growth Rate - Next 5 Years % **N/A**

© Copyright 2018, Zacks Investment Research. All Rights Reserved.

FDA Approval of dermaPACE: *Still lots of unknowns but U.S. regulatory clearance is major win for SNWV*

It was a long time coming but U.S. regulatory marketing clearance of dermaPACE finally came on December 28, 2017 with FDA's classification of SNWV's flagship product as a Class II device under the (now new) generic classification name, "extracorporeal shock wave device for the treatment of chronic wounds".

Per FDA's document, **dermaPACE's indicated use** is "to provide acoustic pressure shockwaves in the treatment of chronic, full-thickness diabetic foot ulcers with wound areas measuring no larger than 16cm^2, which extend through the epidermis, dermis, tendon, or capsule, but without bone exposure. The dermaPACE System is indicated for adult (22 years and older), diabetic patients presenting with diabetic foot ulcers greater than 30 days in duration and is indicated for use in conjunction with standard diabetic ulcer care."

Quick summary of the company's journey;

- **Initial Phase III PMA Study**: In July 2011 SANUWAVE submitted the third and final module of their PMA application seeking FDA clearance of dermaPACE for the treatment of diabetic foot ulcers. The filing was supported by data from what was then expected to be a pivotal regulatory trial – a phase III randomized, controlled, double-blinded study which included 206 patients (99 dermaPACE, 107 sham). Data showed dermaPACE was significantly more effective than sham (standard of care) in wound area closure within four weeks following the last treatment and continued to be so throughout the 12-week evaluation period. In addition, 36% more dermaPACE treated patients achieved full closure within 12 weeks and of the patients that did achieve complete wound closure at 12 weeks, only 4.5% of the dermaPACE cohort experienced wound recurrence, compared to 20% in the sham cohort. And finally, 100% wound closure was found to be statistically significant at 20 weeks (see Appendix for more detail). Despite the compelling data, in December 2011 FDA issued a major deficiency letter citing failure to meet the primary endpoint of 100% wound closure at 12 weeks as the reason that they would not clear the device for sale. Among FDA's recommendations to potentially remedy the deficiency was for SNWV to conduct an additional clinical study
- **Supplemental Study**: In May 2012 FDA approved SNWV's IDE supplement for another study which was designed similar to that of the initial study except for this time it allowed for up to four treatment "boosts" delivered during weeks four and ten – the boosts were aimed at improving upon efficacy (i.e. primary endpoint of 100% wound closure at 12 weeks). FDA agreed to the use of Bayesian statistics which applies sequential analysis allowing for the supplemental data to build on the positive results from the initial larger study. Initially expected to enroll 90 patients, it was subsequently expanded to 130 (1:1 randomization). Results of the combined data from the initial and supplemental study, announced in May 2015, showed that the primary endpoint of 100% wound closure at 12 weeks was still not met. The good news was that safety was still not an issue and secondary data, such as 100% wound closure at weeks 20 and at 12 weeks within certain sub-groups such as patients with higher BMI, was positive. SNWV and MCRA at that point decided to pursue the De Novo FDA pathway which (as compared to PMA) places a greater emphasis on the safety profile.
- **FDA Clearance**: SNWV made their De Novo filing in July 2016. After months of review and some back and forth between SNWV and FDA regarding certain questions and clarifications, the U.S. regulatory agency finally granted marketing clearance and classified dermaPACE as a Class II device on December 28, 2017.

Initial Comments on Relevant Topics

While FDA approval answered the most important question (i.e. will dermaPACE be allowed to be marketed in the U.S.?), it elicits a lot more – many of which will take time to answer. We hit the highlights (in no particular order) below and hope to know more about each topic (as well as likely other topics) as time passes and SNWV progresses along its U.S. commercialization journey – so stay tuned for future updates.

- **Reimbursement**: novel devices often initially go to market in the U.S. sans-dedicated Medicare reimbursement. That'll be the case with dermaPACE. Initially, providers (perhaps, particularly influential KOLs) may have some success billing under a more generic CPT III code – although we expect spotty reimbursement, at best, initially or at least until there is more usage data and perhaps, until following conclusion of supportive post-approval clinical utility and pharmacoeconomic studies. Eventual issuance of a CPT I code will likely be the goal, although that could be a years-long process and will undoubtedly require sufficient usage and economic data.
- **Launch / Initial Roll-Out**: management noted on the (FDA approval) call that they expect to initially roll-out to certain of the ~36 investigators that participated in their FDA clinical studies. Presumably those that are considered more influential KOLs and can benefit with both awareness-building and, perhaps, have greater success on the reimbursement side. SNWV indicated that they expect a soft launch and related revenue in Q1. In Q2 they will be building awareness at several wound care-focused conferences and then in 2H hope to have a more substantial initial commercialization push.

- **Sales / Marketing / Distribution**: we expect the marketing team to be pretty lean, at least during the first 12 months or so given that that period will mostly focus commercialization efforts on already established relationships and attendance at industry events. As it is now, we assume additional incremental hiring in sales/marketing, particularly going into 2019. We think SNWV may also look to bring on some form of third-party partner or distributor for the U.S. – essentially, we think management is keeping their options open.
- **Revenue Model**: as was always expected to be the case – even way back in 2011 when SNWV hoped to get FDA clearance on their first pass, the revenue model will be to place the console for free (or at cost) and to charge on a per-treatment basis. A radio frequency identification (RFID) card will be required to activate the device. Similar to the classic razor / razor-blade business model, the "razor-blade" portion of SANUWAVE's sale is expected to carry high margins (approaching 90%). Clinical studies indicated that between four and eight treatments of dermaPACE are appropriate. Management noted that they have a financing partner lined up that will finance the first lot of consoles (we estimate 50 to 100) in order to not overburden working capital at the get-go.
- **Margin**: expected margin is a major unknown given ambiguity over accessibility and amount of potential reimbursement. And while dermaPACE treatment can be performed at a much lower cost than competing advanced DFU therapies such as negative pressure wound therapy (NPWT) and skin substitutes, economics, along with patient outcomes, drive clinicians' choice of treatment modalities. For now, our conservative, base and liberal cases use per-treatment margins (to SNWV) of $50, $75 and $100, respectively – this is a metric that has significant chance of changing, however, given the reasons cited. We assume that, on average, each patient receives six treatments.
- **U.S. DFU Market Opportunity**: Approximately 25M adults in the U.S. have diabetes, roughly 8% of which have (at any given time) a DFU. Of these ~2M with a DFU, about 12%, or 240k will undergo an amputation every year. Amputation usually results because all available therapies failed to heal an ulcer. So, what is the market opportunity for dermaPACE? If we assume 50% of DFUs heal with standard of care (i.e. prior to the employment of advanced therapies), then on the liberal side the market is about 1M people per year (i.e. every American adult with a DFU). On the conservative side it's about 240k people per year (i.e. assumes dermaPACE is last in line after standard of care and all other advanced therapies failed and the only other option is amputation).
- **Competitive Considerations**: there are several types of advanced DFU wound therapies approved for sale in the U.S. The most common are NPWT (such as KCI's VAC) and skin substitutes, such Apligraft and Dermagraft. Growth factors (i.e. topicals), matrices and stem cells are other therapies that have been used in the treatment of DFU. Ultrasound and electrical stimulation have also been employed as has hyperbaric oxygen therapy.

  Given that NPWT has been used for decades in the treatment of chronic wounds and much of the clinical evidence surrounding chronic wound therapy lies with it (i.e. NPWT) as well as the skin substitutes, these are the modalities which we view as the most meaningful competition to dermaPACE. All of these are more invasive, require greater skill to employ and are much more expensive than is treatment with dermaPACE. SNWV estimates cost of full treatment regimen with dermaPACE is approximately $3k, as compared to ~$15k for NWPT and ~$10k for skin substitutes.

  We also note that while all of three of these other products did achieve 100% wound closure in their respective FDA pivotal trials, the practical efficacy difference as compared to dermaPACE may be much less meaningful. In their initial IDE trial, median closure in dermaPACE treated ulcers achieving > 90% closure was over 99% and anything greater than 70% indicates that the wound is well on its way to being completely healed. In addition, ulcers treated with dermaPACE were almost 60% larger than those in the control group (making achieving significance that much more difficult). Also noteworthy is that trial protocol in V.A.C.'s FDA study allowed for full closure of ulcers to be completed with surgery - this was not allowed in the dermaPACE study - had it and it's conceivable that dermaPACE would have shown statistical significance in 100% closure over standard of care. See our Appendix for more detail on our comparison of dermaPACE vs. these other therapies.

  Also important is that dermaPACE will not necessarily need to compete directly with these or any other advanced DFU therapies given that wound healing is often a trial and error approach – if one modality fails, the clinician will move to the next, and so on. While the initial goal is to heal the wound as fast as possible, the ultimate goal is to at least eventually heal it and avoid amputation. But, the more competitive the product, likely the better chance it has to be closer to the front in the continuum of care.
- **Ancillary Benefits**: FDA approval should afford other ancillary benefits including greater awareness and adoption in overseas markets and help facilitate regulatory clearance in certain other countries as well.

Model Update

We approached modeling two different ways, one based on market penetration and the other based on unit placements. Our model incorporates three cases; conservative, base and liberal – which are based on assumed margin (to SNWV), market opportunity, unit placements rate and number of treatments per console.

We incorporate the following assumptions (all of which are subject to updating);

Market penetration model:

Market size:

- maximum market (i.e. liberal case): 1M patients per year
- minimum market (i.e. conservative case): 240k patients per year
- base market: avg of the two
- market grows at 1%/year

- Penetration: insignificant in 2018, penetration increases by 1% per year
- Number of treatments: assume an avg of 6 treatments per patient for all cases
- Margin per treatment to SNWV:
  - $100 liberal, $75 base, $50 conservative

		2018	2019	2020	2021	2022	2023
Market size							
	liberal	1,000,000	1,010,000	1,020,100	1,030,301	1,040,604	1,051,010
	base	620,000	626,200	632,462	638,787	645,174	651,626
	conservative	240,000	242,400	244,824	247,272	249,745	252,242
Penetration	liberal	0.3%	1.0%	2.0%	3.0%	4.0%	5.0%
	base	0.3%	1.0%	2.0%	3.0%	4.0%	5.0%
	conservative	0.3%	1.0%	2.0%	3.0%	4.0%	5.0%
Treatments	liberal	20,000	60,600	122,412	185,454	249,745	315,303
	base	12,400	37,572	75,895	114,982	154,842	195,488
	conservative	4,800	14,544	29,379	44,509	59,939	75,673
Margin	liberal	$100	$101	$102	$103	$104	$105
	base	$75	$76	$77	$77	$78	$79
	conservative	$50	$51	$51	$52	$52	$53
Revenue	liberal	$2,000,000	$6,120,600	$12,487,248	$19,107,363	$25,988,561	$33,138,664
	base	$1,120,000	$3,427,536	$6,992,859	$10,700,123	$14,553,594	$18,557,652
	conservative	$240,000	$734,472	$1,498,470	$2,292,884	$3,118,627	$3,976,640

Unit placements model:

Utilization:

- on the low end (i.e. conservative), we assume one treatment per console per day and an average of 6 treatments per patient (equal to ~4 patients per console per month)
- on the high end (i.e. liberal), we assume two treatments per console per day and an average of 6 treatments per patient (equal to ~8 patients per console per month)
- base case is the average of the two

- Margin per treatment to SNWV:
  - $100 liberal, $75 base, $50 conservative

		2018	2019	2020	2021
Consoles	liberal	40	160	240	360
	base	25	100	150	225
	conservative	10	40	60	90
onsole/mth	liberal	7	11	16	25
	base	6	8	13	19
	conservative	4	6	9	14
Treatments	liberal	21,110	126,662	284,990	641,228
	base	10,197	71,971	161,935	364,354
	conservative	2,880	17,280	38,880	87,480
Margin	liberal	$100	$101	$102	$103
	base	$50	$76	$77	$77
	conservative	$50	$51	$51	$52
Revenue	liberal	$2,111,040	$12,792,902	$29,071,871	$66,065,826
	base	$1,127,520	$6,832,771	$15,527,473	$35,286,181
	conservative	$144,000	$872,640	$1,983,074	$4,506,537

Based on our belief that the early years of U.S. commercialization will be based on “picking their spots” based on hospitals, wound centers and clinics as well as KOLs where reimbursement may be most favorable, we think the unit placement model may be most appropriate as a guide. This is also the reason why we do not extend this model past the year 2021.

We reiterate that our model is subjecting to updating. It will almost certainly change based on when there is more definitive information to make more informed judgments about inputs. And while we assume conservative, base and liberal cases, our inputs for each should not be interpreted to mean that, for example, margin can not significantly exceed $100 per treatment.

Valuation

We have used P/S comp as our valuation methodology – for consistency, we continue to use that. Smith & Nephew has traded at approximately 3.5x analyst’s 2020 forecasted revenue. With the updates to our model, we have SNWV generating approximately $22M (when including JV revenue – which on GAAP basis will be accounted for as a component in equity interest calculation) in revenue in 2020 - based on the SNN comp 2020 3.5x P/S multiple, this values SNWV at about $0.55/share.

FINANCIAL MODEL

SANUWAVE Health, Inc.

	2015 A	Q1A	Q2A	Q3A	Q4A	2016 A	Q1A	Q2A	Q3A	Q4E	2017 E	2018 E	2019 E	2020 E
Total Revenues	$965.5	$269.3	$203.4	$255.7	$647.7	$1,376.1	$149.6	$111.0	$161.6	$251.8	$584.0	$3,496.0	$9,726.0	$19,675.0
YOY Growth	*13.9%*	*28.0%*	*-15.2%*	*78.0%*	*74.3%*	*42.5%*	*-44.5%*	*-45.4%*	*-36.8%*	*-61.1%*	*-57.6%*	*498.6%*	*178.2%*	*102.3%*
Cost of Revenues	$285.0	$73.2	$78.0	$98.7	$315.3	$565.1	$55.14	$24.7	$61.7	$141.6	$283.1	$966.3	$3,036.9	$4,858.1
Gross Income	$680.5	$196.1	$125.4	$157.0	$332.4	$810.9	$94.4	$86.4	$99.9	$110.2	$300.9	$2,529.7	$6,689.1	$14,816.9
Gross Margin	*70.5%*	*72.8%*	*61.7%*	*61.4%*	*51.3%*	*58.9%*	*63.1%*	*77.8%*	*62.6%*	*58.2%*	*51.5%*	*72.4%*	*68.8%*	*75.3%*
R&D	$2,172.9	$310.0	$476.2	$266.5	$76.0	$1,128.6	$260.3	$437.9	$266.8	$297.0	$1,262.1	$1,854.0	$2,026.0	$2,285.0
%R&D	*225.0%*	*115.1%*	*234.1%*	*104.2%*	*11.7%*	*82.0%*	*174.1%*	*394.4%*	*165.1%*	*118.0%*	*216.1%*	*53.0%*	*20.8%*	*11.6%*
SG&A	$2,735.1	$499.1	$589.9	$645.9	$938.9	$2,673.8	$448.6	$951.9	$475.4	$692.0	$2,567.9	$3,551.9	$7,625.2	$14,657.9
%G&A	*283.3%*	*185.3%*	*290.0%*	*252.6%*	*145.0%*	*194.3%*	*299.9%*	*857.2%*	*294.2%*	*274.8%*	*128.0%*	*101.6%*	*78.4%*	*74.5%*
Depreciation	$3.6	$0.8	$0.8	$1.6	$16.6	$19.9	$6.1	$6.0	$5.5	$6.0	$23.5	$45.0	$75.0	$75.0
Amortization	$306.7	$76.7	$76.7	$76.7	$76.7	$306.8	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Write down of assets	($100.0)	$0.0	$0.0	$0.0	($1.6)	($1.6)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Operating Income	($4,437.8)	($690.5)	($1,018.2)	($833.6)	($774.3)	($3,316.5)	($620.6)	($1,309.4)	($647.8)	($884.8)	($3,552.7)	($2,921.2)	($3,037.1)	($2,201.0)
Operating Margin	*-459.6%*	*-256.4%*	*-500.6%*	*-326.1%*	*-119.5%*	*-241.0%*	*-415.0%*	*-1179.2%*	*-400.9%*	*-351.4%*	*-608.3%*	*-83.6%*	*-31.2%*	*-11.2%*
Total Other Expense	($372.5)	($1,034.1)	($104.0)	($306.2)	($1,677.3)	($3,121.5)	$127.1	($106.5)	($203.5)	($235.0)	($418.0)	($1,275.0)	($1,300.0)	($1,300.0)
Pre-Tax Income	($4,810.2)	($1,724.6)	($1,122.1)	($1,139.8)	($2,451.5)	($6,438.0)	($493.5)	($1,415.9)	($851.3)	($1,119.8)	($3,970.6)	($4,196.2)	($4,337.1)	($3,501.0)
Taxes	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Tax Rate	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Net Income	($4,823.7)	($1,721.6)	($1,127.8)	($1,142.1)	($2,465.5)	($6,456.9)	($493.5)	($1,415.9)	($851.3)	($1,119.8)	($3,970.6)	($4,204.7)	($3,787.3)	($2,958.3)
YOY Growth	*-19.5%*	*46.9%*	*-25.9%*	*1.4%*	*145.9%*	*33.9%*	*-71.3%*	*25.5%*	*-25.5%*	*-54.6%*	*-38.5%*	*5.9%*	*-9.9%*	*-21.9%*
Net Margin	*-499.6%*	*-639.2%*	*-554.5%*	*-446.7%*	*-380.7%*	*-469.2%*	*-330.0%*	*-1275.1%*	*-526.9%*	*-444.7%*	*-679.9%*	*-120.3%*	*-38.9%*	*-15.0%*
EPS (continuing ops)	($0.08)	($0.02)	($0.01)	($0.01)	($0.02)	($0.06)	($0.00)	($0.01)	($0.01)	($0.01)	($0.03)	($0.02)	($0.02)	($0.01)
Diluted Shares O/S	63,025	75,220	102,646	115,529	137,084	107,620	138,042	138,993	139,100	139,250	138,846	190,000	215,000	225,000

Brian Marckx, CFA

© Copyright 2018, Zacks Investment Research. All Rights Reserved.

APPENDIX

Phase III IDE Study

Results of SANUWAVE's Investigational Device Exemption trial, which were announced in December 2010, showed dermaPACE was more effective than standard of care in the treatment of diabetic foot ulcers. The data was included in the third and final module (filed in July 2011) of SANUWAVE's PMA application seeking FDA approval of dermaPACE for the treatment of diabetic foot ulcers.

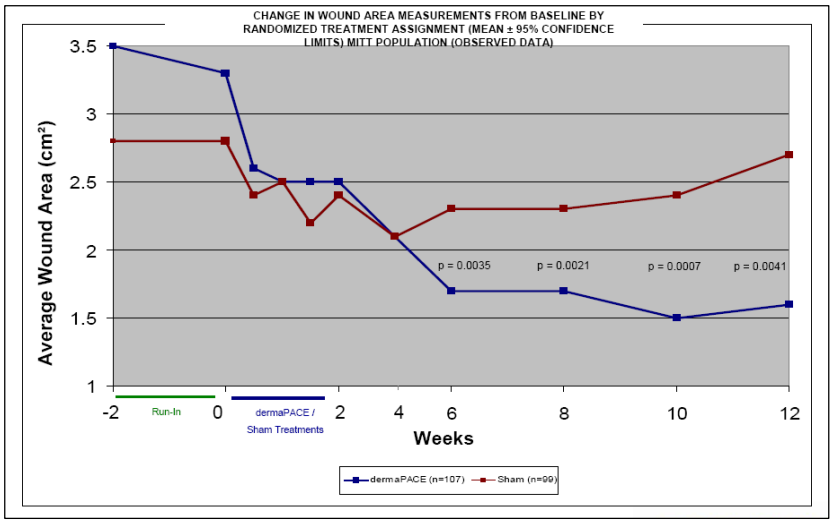
The 26-week, multi-site U.S. study included 206 patients suffering from diabetic foot ulcers. Patients were randomized to either treatment with dermaPACE plus current standard of care (n=107) or sham (i.e. – placebo) plus standard of care (n=99). dermaPACE treated patients received four 20-minute procedures over two weeks (i.e. – two 20-minute sessions per week). Standard of care continued for 12 weeks. Patient safety follow-up continued for 12 weeks following the initial 12-week patient assessment period. Patients and physicians were both blinded to which patients were receiving which treatment – double-blinding eliminates the potential for human bias in the data. The trial protocol also did not allow for surgical closure of a partially healed wound – which allowed for a true picture of the efficacy of dermaPACE versus sham over time.

Primary endpoint was full wound closure confirmed at two consecutive visits. Secondary endpoints were time to closure, reduction in total wound surface area and volume, rate of improvement, long-term safety, and skin appearance and pain assessments.

Results….

Top-line results showed treatment with dermaPACE was significantly more effective than sham (i.e. – only standard of care) in wound area closure within four weeks following the last treatment and continued to be so throughout the twelve week evaluation period. At week twelve, 45% of dermaPACE treated patients experienced 90% or greater wound closure, compared to only 26% of sham-control patients (statistically significant, p=0.0182). Also at week twelve, patients with 70% or greater wound closure included 66% of those receiving dermaPACE treatment compared to just 47% of sham patients (statistically significant, p=0.0227). At twelve weeks the average size in reduction of the ulcer was 56% for dermaPACE patients versus only 7% with sham patients (statistically significant, p=0.0041).

	dermaPACE	Sham	p-value
≥ 90% closure @ 12 weeks	45%	26%	0.0182
≥ 70% closure @ 12 weeks	66%	47%	0.0227
Average reduction in size of ulcer @ 12 weeks	56%	7%	0.0041



SOURCE:

© Copyright 2018, Zacks Investment Research. All Rights Reserved.

While superiority of dermaPACE over sham on the primary endpoint (100% closure) was not statistically significant, 36% more dermaPACE treated patients achieved full closure within twelve weeks. In addition (and of considerable importance), of the patients that did achieve complete wound closure at twelve weeks, only 4.5% of the dermaPACE cohort experienced wound recurrence, compared to 20% in the sham cohort.

Although superiority on full closure was not statistically significant, based on the strict protocol of the study restricting closure through surgery, a 90% or greater closure rate was considered to be clinically meaningful. As the pictures below indicate (patient "A" achieved "only" 97% closure), 100% closure (as defined by the study protocol) is likely not a necessary threshold to meet in clinical practice for wounds to completely heal. When looking at wounds that had reduced in size by $\geq$ 90%, dermaPACE was shown to be significantly (p = 0.0161) more effective than sham with 48% (51 of 107) dermaPACE patients meeting this endpoint versus only 31% (31 of 99) of sham control patients. Median wound closure was over 99% for dermaPACE treated patients in this composite analysis and dermaPACE patients were twice as likely to achieve 90% - 100% wound closure compared to sham patients. The composite data was especially impressive considering that dermaPACE treated patients started with wounds 58% larger than those in the sham-control group. Safety data was also good, with no difference in the rate of adverse events between the study and control groups.

SAMPLE IMAGES FROM SANUWAVE'S PHASE III IDE CLINICAL TRIAL

Both patient A (left) and patient B (right) were treated with dermaPACE. The pictures on top were taken at their initial physician visit. The pictures at bottom were taken on each patient's 11th visit (i.e. - week 12). At week 12 patient A achieved 97% improvement while Patient B achieved 100% improvement (i.e. – full wound closure).









SOURCE:

Other Advanced DFU Therapies

Dermagraft

Dermagraft is a bio-engineered skin substitute. A skin substitute is essentially a patch saturated with biological material (human cells) that is sutured or glued over the wound. This patch secretes human collagen, proteins and growth factors which aid in healing the wound. Dermagraft received FDA approval through PMA in 2001 for the treatment of DFUs of greater than six weeks duration. Medicare and private insurers covers up to eight applications of Dermagraft for the treatment of DFU.

Dermagraft



SOURCE: http://www.bu.edu/woundbiotech/bioengineered/DermaProductSeries/pages/Picture%2044.htm

Apligraf

Apligraf, another skin substitute, is manufactured and marketed by privately-held Organogenesis (was previously marketed by Novartis). Apligraf was initially approved for use in venous leg ulcers and in June 2000 received FDA approval for the treatment of DFU of greater than a 3-week duration. Medicare and private insurers reimburse for each application (up to five) of Apligraf.

Apligraf



SOURCE:

Negative Pressure Wound Therapy

Negative Wound Pressure Therapy (NPWT) uses a device to create a controlled vacuum (i.e. - negative pressure) to the wound through a foam dressing. The vacuum removes infectious fluids and material from the wound, draws the wound edges together and promotes formation of new tissue.

In the U.S., NPWT is currently reimbursed by Medicare as well as private insurers while reimbursement in foreign jurisdictions varies.

NPWT Device and Application





CLINICAL DATA COMPARISON

Efficacy of DFU treatment in clinical trials is typically measured by rate of closure and wound recurrence. Aside from efficacy, other metrics that are commonly included as endpoints are safety and patient comfort. We summarize data from a select number of clinical studies of the leading advanced DFU therapies and compare those to results from dermaPACE's IDE study. Some of the competitor therapy data is taken from more than one study as not all metrics were included in a single study. As there have been several other studies done aside from the ones we highlight, our comparison does not cover the totality of study data on advanced DFU therapy.

The data in the table are from clinical studies of each therapy versus standard of care.

		dermaPACE	Dermagraft	V.A.C.	Apligraf
TRIAL RESULTS	Closure rate	48.0%	30.0%	43.0%	**56.0%**
	Recurrence rate post-closure	**4.5%**	18.0%	N/ A	40.0%
	Adverse events vs. control	similar	similar	similar	similar
TRIAL DESIGN	N =	206	245	335	208
	Closure endpoint	≥ 90%	100%	100%	100%
	Trial duration	12 weeks	12 weeks	16 weeks	12 weeks
	# of procedures	**4**	up to 8	dressing chged 3x/ week	up to 5
	Blinding	**Double**	Single	None	None

...our take on the data

Keeping in mind that it can be misleading to make an apples-to-apples comparison of the data, we offer some potential points of interest in the trial protocols and data sets;

- **Closure endpoint:** dermaPACE data is from the composite analysis (endpoint of ≥ 90%). dermaPACE failed to show significance in the primary endpoint of 100% closure in the IDE trial. All three competing devices showed significance in their primary endpoint of 100% closure. The difference, in clinical practice, may be largely meaningless, however. Median closure in dermaPACE treated ulcers achieving ≥ 90% closure was over 99% and anything greater than 70% indicates that the wound is well on its way to being completely healed. In addition, ulcers treated with dermaPACE were almost 60% larger than those in the control group (making achieving significance that much more difficult). Also noteworthy is that trial protocol in the V.A.C. study allowed full closure of ulcers to be completed with surgery - this was not allowed in the dermaPACE study - had it and it's conceivable that dermaPACE would have shown statistical significance in 100% closure over standard of care.

- **Blinding:** dermaPACE was the only trial where both the physician and patient were blinded to which treatment (experimental or control) was being used - in none of the trials of the other therapies was the physician blinded. As the physician must make a (somewhat subjective) determination relative to efficacy (i.e. - closure rates, change in size of ulcers, etc), not blinding the physician potentially introduces bias in favor of the experimental treatment.

- **Treatment duration:** dermaPACE's closure and recurrence rates versus the competing treatments are especially compelling given that dermaPACE requires the lowest treatment burden with patients receiving only four 20-minute procedures over a two-week period. Dermagraft patients received up to eight applications (one per week for eight weeks) while Apligraf was applied up to five times (once per week). The V.A.C. treated patients received treatment for up to 16 weeks. V.A.C. treatment requires that suction is constantly applied to the wound (i.e. - the patient is hooked up to the device for the entire 16 weeks) and dressing is changed at least three times per week.

- **Closure rate:** dermaPACE's 48% closure rate stacks up better than both Dermagraft and V.A.C. We acknowledge dermaPACE's lower endpoint threshold could have benefitted its closure rate - but this could potentially have been more than offset by not allowing surgical closure or other differences among the trial protocols. While Apligraf's 56% closure rate slightly bested that of dermaPACE, this appears to be

significantly more than offset by the difference in rates of recurrence (40% with Apligraf versus only 4.5% with dermaPACE).

- **Recurrence rate:** only 4.5% of dermaPACE treated wounds reopened after achieving complete closure, compared with 18% and 40% of the Dermagraft and Apligraf treated wounds, respectively. The V.A.C. study did not report rates of recurrence as this study allowed surgical closure. The results, again, are not necessarily directly comparable for the reasons already stated along with that we don't know the number of dermaPACE patients achieving complete closure (was not included in the top-line results announcement).

- **Safety:** while none of the therapies was associated with a higher rate of adverse events compared to standard of care, we note that dermaPACE is the least invasive of the four therapies. While only speculation at this point, given its non-invasive nature, over time, dermaPACE may prove to be a safer treatment.

HISTORICAL ZACKS RECOMMENDATIONS



DISCLOSURES

The following disclosures relate to relationships between Zacks Small-Cap Research ("Zacks SCR"), a division of Zacks Investment Research ("ZIR"), and the issuers covered by the Zacks SCR Analysts in the Small-Cap Universe.

ANALYST DISCLOSURES

I, Brian Marckx, CFA, hereby certify that the view expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the recommendations or views expressed in this research report. I believe the information used for the creation of this report has been obtained from sources I considered to be reliable, but I can neither guarantee nor represent the completeness or accuracy of the information herewith. Such information and the opinions expressed are subject to change without notice.

INVESTMENT BANKING AND FEES FOR SERVICES

Zacks SCR does not provide investment banking services nor has it received compensation for investment banking services from the issuers of the securities covered in this report or article.
Zacks SCR has received compensation from the issuer directly or from an investor relations consulting firm engaged by the issuer for providing non-investment banking services to this issuer and expects to receive additional compensation for such non-investment banking services provided to this issuer. The non-investment banking services provided to the issuer includes the preparation of this report, investor relations services, investment software, financial database analysis, organization of non-deal road shows, and attendance fees for conferences sponsored or co-sponsored by Zacks SCR. The fees for these services vary on a per-client basis and are subject to the number and types of services contracted. Fees typically range between ten thousand and fifty thousand dollars per annum. Details of fees paid by this issuer are available upon request.

POLICY DISCLOSURES

This report provides an objective valuation of the issuer today and expected valuations of the issuer at various future dates based on applying standard investment valuation methodologies to the revenue and EPS forecasts made by the SCR Analyst of the issuer's business.
SCR Analysts are restricted from holding or trading securities in the issuers that they cover. ZIR and Zacks SCR do not make a market in any security followed by SCR nor do they act as dealers in these securities. Each Zacks SCR Analyst has full discretion over the valuation of the issuer included in this report based on his or her own due diligence. SCR Analysts are paid based on the number of companies they cover. SCR Analyst compensation is not, was not, nor will be, directly or indirectly, related to the specific valuations or views expressed in any report or article.

ADDITIONAL INFORMATION

Additional information is available upon request. Zacks SCR reports and articles are based on data obtained from sources that it believes to be reliable, but are not guaranteed to be accurate nor do they purport to be complete. Because of individual financial or investment objectives and/or financial circumstances, this report or article should not be construed as advice designed to meet the particular investment needs of any investor. Investing involves risk. Any opinions expressed by Zacks SCR Analysts are subject to change without notice. Reports or articles or tweets are not to be construed as an offer or solicitation of an offer to buy or sell the securities herein mentioned.