Technical Supplements for Econometric Models and Sensitivity Analyses

Prevalence of Chronic Wounds and Spending Distribution During 2020-2021 from Main Analysis

Number of 15 different types of wound patients and spending distribution during 2020-2021 are shown in **Supplemental Table 1**. An estimated 10.9% of chronic wound patients in our data have COVID-19 during 2020-2021. Pressure ulcers have the highest prevalence rate of COVID-19 patients (22.5%), followed by arterial ulcer (17.1%) and diabetic foot ulcer (16.8%). Based on average Medicare spending, the top three wound categories are arterial ulcer, diabetic foot ulcer and pressure ulcers with prevalence rates of 4.8%, 5% and 16.8% respectively.

Supplemental Table 1. Number of Different Types of Chronic Wound Patients and Average Spending During COVID-19 Period (2020-2021)

	Total beneficiaries	Prevalence of wounds	Mean spending in 2020-2021	Prevalence of COVID-19 diagnosed beneficiaries
Venous ulcer	431,955	5.80%	$14,262	12.80%
Pressure ulcer	1,246,675	16.80%	$24,612	22.50%
Chronic ulcer	1,198,740	16.20%	$19,673	15.90%
Surgical wounds	2,066,182	27.90%	$14,335	11.10%
Skin disorder	1,592,137	21.50%	$5,117	9.40%
Traumatic wound	833,041	11.30%	$19,593	14.30%
Burn	110,265	1.50%	$8,962	9.20%
Arterial ulcer	355,464	4.80%	$31,481	17.10%
Diabetic foot ulcer	366,844	5.00%	$30,825	16.80%
Surgical infection	1,856,379	25.10%	$11,807	11.50%
Diabetic infection	1,913,987	25.80%	$12,511	12.30%
Venous infection	600,481	8.10%	$15,563	11.50%
Skin disease	1,592,137	21.50%	$5,117	9.40%
Radiation latte effect	252,305	1.50%	$8,993	8.60%
Other wounds	109,631	3.40%	$33,733	23.60%
Total wound patients	7,404,505	100%	$8,001	10.93%

Source: Medicare 100% Research Identifiable Files (RIF) data under Data Use Agreement (DUA) 54757

One-to-one Optimal Propensity Score Matching Model With Replacement (Main Analysis)

We used Logistic regression model to obtain a one-to-one optimal Propensity score match with replacement between treatment and comparison group in the main analyses. The Logistic regression model includes beneficiary level demographic information (age, gender, race and ethnicity, Medicare dual eligibility), health status or severity of individuals (HCC scores), and geographic location factors (census regions). The optimal matching with replacement model utilizes a more conservative approach and allows for matched-pair samples between treatment and comparison group, even if some control observations are matched to more than one treatment group beneficiaries. The matching is performed on the logit of the propensity score, using calipers of width equal to 0.2 standard deviations. This is consistent with literature showing that matching on the logit of the propensity score for estimating treatment effects performs better than matching on the propensity score itself, and that matches within 0.2 standard deviations of the logit of the propensity score are optimal.[1]

Patient characteristics (after propensity score match) of the three chronic wound categories (Diabetic Foot Ulcers, Pressure Ulcers, Surgical Wounds & Infections) for the treatment group (with COVID-19) and comparison group (without COVID-19) are presented in **Supplemental Table 2** below. Unadjusted average values of spending, utilization and mortality outcomes of all patients with chronic wounds are shown in **Supplemental Table 3** and **Supplemental Table 3.1** respectively. Unadjusted average values of spending, utilization and mortality outcomes of the three chronic wound types are shown in **Supplemental Table 4**, **Supplemental Table 5** and **Supplemental Table 5.1** respectively.

[1] Austin PC. An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies, *Multivariate Behavioral Research*, 2011; 46:3, 399-424, DOI: 10.1080/00273171.2011.568786

Supplemental Table 2. Patient Characteristics for Three Chronic Wound Categories With COVID-19 (Treatment Group) Versus Without COVID-19 (Comparison Group) After One-to-one Optimal Propensity Score Match With Replacement and Balanced Diagnostic Test Using Standardized Mean Difference (SMD)

	Diabetic foot ulcers			Pressure ulcers			Surgical wounds & infections		
Covariates	**Treatment group (N=42,476)**	**Comparison group (N=28,620)**	**SMD**	**Treatment group (N=79,421)**	**Comparison group (N=39,919)**	**SMD**	**Treatment group (N=139,397)**	**Comparison group (N=129,617)**	**SMD**
Age	69.47±12.38	71.39±12.0	-0.16	74.52±13.26	75.90±13.44	-0.1	69.82±13.98	71.96±13.2	-0.16
Female	38.70%	38.90%	0.00	55.00%	54.00%	-0.03	51.30%	51.70%	-0.01
Dual eligibility	48.60%	50.60%	-0.04	55.00%	52.00%	0.05	46.30%	43.40%	0.06
White	71.00%	74.00%	-0.08	76.00%	75.00%	-0.06	76.00%	79.00%	-0.06
Black	18.00%	16.00%	0.04	16.00%	17.00%	0.05	14.00%	12.00%	0.04
Hispanic	5.00%	5.00%	0.03	3.00%	3.00%	0.01	4.00%	3.00%	0.04
Asian	1.20%	0.90%	0.03	1.40%	1.60%	0.02	1.30%	1.40%	-0.01
Native	2.00%	1.80%	0.02	1.00%	0.90%	0.01	1.00%	1.20%	0.02
HCC scores	3.71±1.95	3.32±1.78	0.21	3.23±2.05	2.90±1.86	0.17	2.95±1.77	2.55±1.52	0.24
New england	4.40%	4.80%	-0.02	5.30%	5.30%	0.01	4.90%	5.20%	-0.02
Middle atlantic	10.90%	9.40%	0.05	13.70%	14.10%	-0.01	11.60%	10.50%	0.04
East north central	10.30%	11.10%	-0.03	11.00%	11.00%	-0.01	9.90%	10.70%	-0.02
West north central	19.50%	20.70%	-0.03	19.70%	20.00%	-0.03	20.20%	21.70%	-0.04
South atlantic	17.10%	17.90%	-0.02	15.70%	15.60%	0	15.90%	15.60%	0.01
East south central	14.40%	14.40%	0.00	13.00%	13.00%	0.01	13.30%	12.70%	0.02
West south central	5.60%	5.30%	0.02	4.70%	4.50%	0.02	5.60%	5.00%	0.03
Mountain	3.00%	2.50%	0.03	2.00%	2.00%	0.01	3.50%	3.20%	0.02
Pacific	11.90%	11.40%	0.02	12.40%	12.20%	0.04	12.30%	12.40%	0.00

Note: For continuous variables e.g., Age and Hierarchical Condition Category (HCC) scores, (Mean ± S.D) values are reported

Supplemental Table 3. Unadjusted per Member per Year (PMPY) Expenditures and Average Utilizations for All Patients With Chronic Wounds

Unadjusted PMPY expenditures outcomes for overall chronic wound patients				
Medicare expenditures by service categories		**Pre - period**	**Post-period**	**(Post-pre) period**
Total expenditures	Treatment	$13,086	$20,430	$7,344
	Comparison	$10,777	$16,118	$5,340
Physician expenditures	Treatment	$922	$3,365	$2,443
	Comparison	$667	$2,496	$1,829
Inpatient expenditures	Treatment	$7,362	$10,218	$2,856
	Comparison	$6,369	$7,563	$1,193
Outpatient expenditures	Treatment	$1,184	$1,246	$61
	Comparison	$919	$1,060	$142
Rest of the expenditure categories (SNF, HHA, hospice and DME)	Treatment	$3,618	$5,602	$1,984
	Comparison	$2,822	$4,999	$2,177
Unadjusted average utilization outcomes for overall chronic wound patients				
Utilizations outcomes		**Pre - period**	**Post-period**	**(Post-pre) period**
ED visits	Treatment	2.44	2.16	-0.28
	Comparison	1.97	1.61	-0.37
Inpatient admission (Y/N)	Treatment	0.37	0.36	-0.01
	Comparison	0.33	0.29	-0.04

Supplemental Table 3.1. Unadjusted Mortality Rate for All Chronic Wound Patients

Mortality for diabetic foot ulcer patients	
Mortality (Y/N)	Post period
Treatment	0.16
Control	0.12

Note: We analyzed mortality in the post-period only.

Supplemental Table 4. Unadjusted per Member per Year (PMPY) Expenditures for Three Chronic Wound Types Patients

Expenditures outcomes for diabetic foot ulcers patients				
Medicare expenditures by service categories		**Pre - period**	**Post-period**	**(Post-pre) period**
Total Medicare expenditures	Treatment	$21,500	$36,682	$15,182
	Control	$19,377	$30,028	$10,651
Physician expenditures	Treatment	$1,578	$4,924	$3,346
	Control	$1,514	$3,964	$2,450
Inpatient expenditures	Treatment	$12,229	$19,077	$6,848
	Control	$10,618	$14,988	$4,370
Outpatient expenditures	Treatment	$2,712	$2,755	$44
	Control	$2,805	$2,584	-$222
Rest of the expenditure categories (SNF, HHA, hospice and DME)	Treatment	$506	$1,023	$517
	Control	$508	$823	$314
Expenditures outcomes for pressure ulcers patients				
Medicare expenditures by service categories		**Pre - period**	**Post-period**	**(Post-pre) period**
Total Medicare expenditures	Treatment	$18,038	$29,847	$11,809
	Control	$19,574	$27,371	$7,798
Physician expenditures	Treatment	$1,268	$4,844	$3,576
	Control	$1,086	$4,462	$3,376
Inpatient expenditures	Treatment	$10,205	$14,529	$4,324
	Control	$11,807	$12,545	$738
Outpatient expenditures	Treatment	$1,369	$1,306	-$62
	Control	$1,330	$1,302	-$28
Rest of the expenditure categories (SNF, HHA, hospice and DME)	Treatment	$5,197	$9,168	$3,971
	Control	$5,350	$9,062	$3,712
Expenditures outcomes for surgical wounds & infections patients				
Medicare expenditures by service categories		**Pre - period**	**Post-period**	**(Post-pre) period**
Total Medicare expenditures	Treatment	$17,236	$24,006	$6,770
	Control	$14,694	$18,369	$3,676
Physician expenditures	Treatment	$1,027	$3,050	$2,023
	Control	$713	$2,326	$1,613
Inpatient expenditures	Treatment	$10,162	$12,682	$2,520
	Control	$9,201	$9,565	$364
Outpatient expenditures	Treatment	$1,526	$1,557	$30
	Control	$1,125	$1,253	$128

Rest of the expenditure categories (SNF, HHA, hospice and DME)	Treatment	$4,520	$6,717	$2,197
	Control	$3,655	$5,226	$1,571

Supplemental Table 5. Unadjusted Average Utilization Outcomes for Three Chronic Wound Patients

Utilization outcomes for diabetic foot ulcers patients				
Utilizations (diabetic foot ulcer)		**Pre - period**	**Post-period**	**(Post-pre) period**
ED visits	Treatment	2.97	2.72	-0.25
	Comparison	2.39	2.06	-0.34
Inpatient admission (Y/N)	Treatment	0.48	0.49	0.01
	Comparison	0.45	0.4	-0.05
Utilization outcomes for pressure ulcers patients				
Utilizations (pressure ulcer)		**Pre - period**	**Post-period**	**(Post-pre) period**
ED visits	Treatment	2.53	2.25	-0.28
	Comparison	2.41	1.89	-0.52
Inpatient admission (Y/N)	Treatment	0.45	0.44	-0.01
	Comparison	0.46	0.39	-0.06
Utilization outcomes for surgical wounds & infections patients				
Utilizations (surgical wounds & infections)		**Pre - period**	**Post-period**	**(Post-pre) period**
ED visits	Treatment	2.88	2.49	-0.38
	Comparison	2.3	1.73	-0.57
Inpatient admission (Y/N)	Treatment	0.41	0.39	-0.02
	Comparison	0.38	0.3	-0.08

Supplemental Table 5.1. Unadjusted Mortality Rate for Three Chronic Wound Patients

Mortality for diabetic foot ulcer patients	
Mortality (Y/N)	Post period
Treatment	0.20
Control	0.17
Mortality for pressure ulcer patients	
Mortality (Y/N)	Post period
Treatment	0.26
Control	0.24

Mortality for surgical wound & infections patients	
Total payment	Post
Treatment	0.15
Control	0.12

Note: We analyzed mortality in the post-period only

Sensitivity Analyses

The database for sensitivity analyses consisted of one year (2019) of pre-period and at least one year of post-period information (2020 to 2021). From 2019 to 2021, we first identified 10,324,353 overall wound care patients (15 chronic wounds). COVID-19 diagnosed patients were identified by ICD-10 CM codes (B97.29 from January 27, 2020, to March 31, 2020, and U07.1 from April 1, 2020, and after). The new beneficiaries who entered in 2021 and did not have pre-period information were excluded from the database. Thus, we restricted the data to 7,834,672 beneficiaries who were enrolled in the whole study period (2019 to 2021). From the Master Beneficiary Summary Files (MBSF), we collected beneficiary demographic and geographic location factors. Hierarchical Condition Categories (HCC) scores were constructed using one year lookback-period diagnosis.

We performed two sensitivity analyses. In the first sensitivity analysis, we included all the demographic characteristics (age, gender, race, dual eligibility), health risk characteristics (HCC scores) and geographic location factors (census regions) in the regression models (propensity score and outcome models). In the second sensitivity analysis, we included prior wound-related hospitalization and all the covariates that were used in the first sensitivity analysis in the regression models (propensity score and outcome models).

Econometric Models

Since beneficiaries with chronic wounds who were diagnosed with COVID-19 may have different health risks and comorbidities, this may impact their spending and utilization differently. Hence, it is important to account for the differences in health-related risk factors. Therefore, we used an inverse probability of treatment weighting (IPTW) propensity score model to construct the comparison group beneficiaries who were expected to have a similar risk profile as the wound care beneficiaries with COVID-19. We chose IPTW propensity score method so that we could utilize the whole study period data. To develop the IPTW Propensity Score model, we first ran a Logistic Regression Model. Using a Logistic Regression Model, we calculated the probability of being in the treatment group for the base year of data (i.e., 2019) corresponding to each Medicare beneficiary. In the Logistic Regression we included demographic characteristics of patients (age, gender, race and ethnicity, dual eligibility), patient comorbidities (HCC scores) and geographical location factors (CMS census regions) for the first sensitivity analysis. For the second sensitivity analysis, we included prior wound-related hospitalizations and all the covariates used in the first sensitivity analysis.

From the IPTW propensity score model, we derived the Average Treatment effect on Treated (ATT) weights. We used ATT weights corresponding to each beneficiary in the treatment and comparison group to run the Difference-in-Differences regression model. A weighted Generalized Linear Model (GLM) with Log-link function and Gamma Distribution was used to calculate the impact of the COVID-19 on per member per year expenditures.

We performed the balanced diagnostic test to ensure that the observed baseline covariates are similar between the treatment and comparison group beneficiaries. We presented the covariate distributions at the baseline (2019) of the treatment and comparison group prior to and after IPTW propensity score estimates in **Supplemental Table 6**. We compared the groups (treatment

and comparison) prior to IPTW estimates with post IPTW estimates. The standardized mean differences for all the covariates were within the range of -0.10 and 0.10 after the IPTW and thus ensure that all the covariates were balanced between the treatment and comparison groups. Separate IPTW models were estimated for the three chronic wound categories (**Supplemental Table 6.1**, **Supplemental Table 6.2**, and **Supplemental Table 6.3**).

Supplemental Table 6. Baseline Characteristics for All Patients With Chronic Wounds FFS Medicare Beneficiaries Diagnosed With COVID-19 (Treatment Group) Versus Wthout COVID-19 (Comparison Group) in Both Before and After IPTW Propensity Score Weight Assignment and Balanced Diagnostic Test Using Standardized Mean Difference (SMD)

Before IPTW propensity score weight				**After IPTW propensity score weight**		
Covariates	**Treatment group (N=635,909)**	**Comparison group (N=7,198,763)**	**SMD**	**Treatment group (N=635,909)**	**Comparison group (N=7,198,763)**	SMD
Age	74.24±13.07	73.41±12.36	0.065	74.24±13.07	74.27±13.09	-0.003
Female	54.09%	53.86%	0.005	54.09%	54.08%	0.0002
Dual eligibility	42.50%	22.90%	0.427	42.50%	42.64%	-0.003
White	80.21%	85.44%	-0.139	80.21%	80.05%	0.004
Black	11.95%	7.82%	0.138	11.95%	12.04%	-0.003
Hispanic	3.07%	1.80%	0.083	3.07%	3.12%	-0.003
Asian	1.29%	1.32%	-0.003	1.29%	1.30%	-0.001
Native	0.99%	0.68%	0.034	0.99%	1.00%	-0.001
HCC scores	2.68±2.07	1.95±1.79	0.377	2.68±2.07	2.72±2.41	-0.017
New england	4.78%	5.78%	-0.045	4.78%	4.74%	0.002
Middle atlantic	12.72%	8.75%	0.128	12.72%	12.81%	-0.003
East north central	9.92%	10.76%	-0.028	9.92%	9.88%	0.001

West north central	21.25%	22.36%	-0.027	21.25%	21.23%	0.001
South atlantic	16.55%	16.52%	0.001	16.55%	16.56%	-0.0004
East south central	12.75%	10.73%	0.063	12.75%	12.78%	-0.001
West south central	5.35%	5.42%	-0.003	5.35%	5.34%	0.0002
Mountain	2.88%	3.45%	-0.032	2.88%	2.88%	-0.0002
Pacific	11.54%	11.87%	-0.01	11.54%	11.49%	0.001

Note: For continuous variables e.g., Age and Hierarchical Condition Category (HCC) scores, (Mean ± S.D) values are reported

Supplemental Table 6.1. Baseline Characteristics for Diabetic Foot Ulcer FFS Medicare Beneficiaries Diagnosed With COVID-19 (Treatment Group) Versus Without COVID-19 (Comparison Group) in Both Before and After IPTW Propensity Score Weight Assignment and Balanced Diagnostic Test Using Standardized Mean Difference (SMD)

Before IPTW propensity score weight				**After IPTW propensity score weight**		
Covariates	**Treatment group (N=43,007)**	**Comparison group (N=349,616)**	**SMD**	**Treatment group (N=43,007)**	**Comparison group (N=349,616)**	**SMD**
Age	69.68±12.39	70.84±11.95	-0.095	69.68±12.39	69.68±12.39	0.000
Female	37.98%	37.03%	0.020	37.98%	38.01%	0.000
Dual eligibility	49.73%	34.89%	0.304	49.73%	49.74%	-0.003
White	71.09%	77.49%	-0.147	71.09%	71.08%	0.004
Black	17.65%	13.59%	0.112	17.65%	17.65%	-0.003
Hispanic	5.39%	3.56%	0.088	5.39%	5.39%	-0.003
Asian	1.12%	1.18%	-0.006	1.12%	1.12%	-0.001
Native	2.04%	1.47%	0.044	2.04%	2.05%	-0.001
HCC scores	3.93±2.39	3.56±2.29	0.157	3.93±2.39	3.93±2.49	-0.017
New england	4.21%	4.84%	-0.030	4.21%	4.21%	0.001
Middle atlantic	10.80%	7.88%	0.101	10.80%	10.79%	-0.002
East north central	9.93%	11.15%	-0.040	9.93%	9.93%	0.001

West north central	19.95%	21.67%	-0.042	19.95%	19.95%	0.001
South atlantic	17.57%	17.61%	-0.001	17.57%	17.58%	0.000
East south central	14.93%	13.37%	0.045	14.93%	14.96%	-0.001
West south central	5.48%	5.48%	0.000	5.48%	5.49%	0.000
Mountain	2.73%	2.87%	-0.008	2.73%	2.74%	0.000
Pacific	11.79%	11.03%	0.024	11.79%	11.76%	0.001

Note: For continuous variables e.g., Age and Hierarchical Condition Category (HCC) scores, (Mean ± S.D) values are reported

Supplemental Table 6.2. Baseline Characteristics for Pressure Ulcer FFS Medicare Beneficiaries Diagnosed With COVID-19 (Treatment Group) Versus Without COVID-19 (Comparison Group) in Both Before and After IPTW Propensity Score Weight Assignment and Balanced Diagnostic Test Using Standardized Mean Difference (SMD)

Before IPTW propensity score weight				**After IPTW propensity score weight**		
Covariates	**Treatment group (N=176,778)**	**Comparison group (N=1,093,671)**	**SMD**	**Treatment group (N=176,778)**	**Comparison group (N=1,093,671)**	**SMD**
Age	77.32±12.55	78.18±12.78	-0.068	77.32±12.55	77.32±12.58	0.000
Female	55.18%	53.85%	0.027	55.18%	55.25%	-0.001
Dual eligibility	55.62%	35.35%	0.416	55.62%	55.63%	0.000
White	75.59%	81.64%	-0.148	75.59%	75.58%	0.000
Black	16.72%	12.05%	0.133	16.72%	16.71%	0.000
Hispanic	3.01%	2.04%	0.062	3.01%	3.02%	-0.001
Asian	1.66%	1.45%	0.017	1.66%	1.66%	0.000
Native	0.83%	0.73%	0.012	0.83%	0.84%	-0.001
HCC scores	3.43±2.38	3.43±2.41	-0.003	3.43±2.38	3.43±2.37	0.000
New england	4.96%	5.21%	-0.011	4.96%	4.96%	0.000
Middle atlantic	14.54%	11.22%	0.099	14.54%	14.57%	-0.001
East north central	10.65%	11.40%	-0.024	10.65%	10.65%	0.000

West north central	20.85%	22.21%	-0.033	20.85%	20.81%	0.001
South atlantic	15.91%	16.21%	-0.008	15.91%	15.95%	-0.001
East south central	13.43%	11.97%	0.044	13.43%	13.46%	-0.001
West south central	4.40%	4.56%	-0.008	4.40%	4.40%	0.000
Mountain	1.78%	2.47%	-0.047	1.78%	1.79%	0.000
Pacific	11.79%	11.39%	0.013	11.79%	11.74%	0.002

Note: For continuous variables e.g., Age and Hierarchical Condition Category (HCC) scores, (Mean ± S.D) values are reported

Supplemental Table 6.3. Baseline Characteristics for Surgical Wounds and Infections FFS Medicare Beneficiaries Diagnosed With COVID-19 (Treatment Group) Versus Without COVID-19 (Comparison Group) in Both Before and After IPTW Propensity Score Weight Assignment and Balanced Diagnostic Test Using Standardized Mean Difference (SMD)

Before IPTW propensity score weight				**After IPTW propensity score weight**		
Covariates	**Treatment (N=245,344)**	**Comparison group (N=3,522,308)**	**SMD**	**Treatment group (N=245,344)**	**Comparison group (N=3,522,308)**	**SMD**
Age	71.28±13.42	71.73±12.47	-0.035	71.28±13.42	71.28±13.43	0.000
Female	50.31%	51.70%	-0.028	50.31%	50.30%	0.000
Dual eligibility	44.24%	23.88%	0.44	44.24%	44.37%	-0.003
White	77.57%	84.71%	-0.183	77.57%	77.41%	0.004
Black	13.58%	8.29%	0.17	13.58%	13.67%	-0.003
Hispanic	3.67%	1.92%	0.106	3.67%	3.71%	-0.003
Asian	1.23%	1.30%	-0.006	1.23%	1.24%	-0.001
Native	1.23%	0.77%	0.047	1.23%	1.25%	-0.001
HCC scores	2.95±2.31	2.03±1.89	0.438	2.95±2.31	2.99±2.67	-0.017
New england	4.35%	5.38%	-0.048	4.35%	4.32%	0.001
Middle atlantic	11.52%	8.02%	0.118	11.52%	11.57%	-0.002
East north central	9.53%	10.58%	-0.035	9.53%	9.50%	0.001

West north central	21.69%	23.23%	-0.037	21.69%	21.67%	0.001
South atlantic	16.46%	16.14%	0.009	16.46%	16.48%	0.000
East south central	13.79%	11.22%	0.078	13.79%	13.84%	-0.001
West south central	5.48%	5.41%	0.003	5.48%	5.48%	0.000
Mountain	3.11%	3.67%	-0.031	3.11%	3.11%	0.000
Pacific	11.70%	11.83%	-0.004	11.70%	11.67%	0.001

Note: For continuous variables e.g., Age and Hierarchical Condition Category (HCC) scores, (Mean ± S.D) values are reported

Defining the Weights

Suppose the propensity score or the probability of being in the treatment group (chronic wound beneficiaries who are diagnosed with COVID-19) is denoted by p_i, where $p_i = Prob.\ (Zi=1) = \frac{e\,X\beta}{1+eX\beta}$

Z_i = Function for exposure where Z=1 for the treatment group and Z=0 for the Comparison Group

X = Vector which includes all the relevant explanatory variables for the logistic regression model

β= Vector which incorporates all the coefficients corresponding to those explanatory variables.

We have used the predicted probabilities of being in the treatment group from the logistic regression to define the weight for the average treatment effect on the treated (ATT). Let $\widehat{p_i}$ be the predicted probability that an individual will be in the Treatment Group and (1 - $\widehat{p_i}$)be the predicted probability that the individual will be in the Comparison Group.

The weight for the average treatment effect on the treated (ATT) is defined as:

1) $$\boldsymbol{W_{ATT} = Zi + \frac{\widehat{p_i}(1-Z_i)}{1-\widehat{p_i}}}$$

Using formula (1), the ATT weight for the treatment group is 1.

$$\boldsymbol{W_{ATT(treatment\ group)} = Zi + \frac{\widehat{p_i}(1-Z_i)}{1-\widehat{p_i}} = 1 + \frac{\widehat{p_i}(1-1)}{1-\widehat{p_i}} = 1 + \frac{\widehat{p_i}(0)}{1-\widehat{p_i}} = 1 + 0 = 1}$$

Using formula (1), the ATT weight for the comparison group is $\frac{\widehat{p_i}}{1-\widehat{p_i}}$

$$\boldsymbol{W_{ATT(comparison\ group)} = Zi + \frac{\widehat{p_i}(1-Z_i)}{1-\widehat{p_i}} = 0 + \frac{\widehat{p_i}(1-0)}{1-\widehat{p_i}} = \frac{\widehat{p_i}(1)}{1-\widehat{p_i}} = \frac{\widehat{p_i}}{1-\widehat{p_i}}}$$

We have also conducted a balanced diagnostic check between the treatment group and the comparison group to confirm that balance (between covariates) is achieved between the treatment group and the comparison group after applying weights from IPTW Propensity score model.

After deriving the weights corresponding to each beneficiary in each group, we have used these weights to run a Difference-in-Differences regression model for spending and utilization outcomes. We have used Generalized Linear Model (GLM) with Log-link function and Gamma Distribution to estimate the Difference-in-Differences regression model for expenditure metrics. For ED visits, we used two-part models and for Inpatient admissions, we used Logistic regression model. We have checked for multicollinearity among all the covariates in our model and confirmed that there is no multicollinearity before estimating the IPTW and outcome models.

Conceptual Framework of a Difference-in-differences Model:

The Difference-in-Differences estimator is defined as the difference in average spending (or utilization) in the treatment group before and after COVID-19 minus the difference in average spending in the comparison group before and after COVID-19. Suppose $\overline{Y}$ is the per member per year (PMPY) total Medicare spending. Total Medicare spending is the sum of all the seven care settings (Physician, Inpatient, Outpatient, Home Health Agency, Skilled Nursing Facility, Durable Medical Equipment, Hospice) spending. PMPY spending is the average Medicare spending per year. Then, Difference-in-Differences estimation methodology can be described as follows. The following table (**Supplemental Table 7**) shows the Difference-in-Differences (Diff-in-Diff) estimate at the bottom right corner.

Supplemental Table 7. Pre- and Post-Period Spending Differences Between Treatment and Comparison Group

Changes in PMPY spending			
	Pre-period	Post-period	Post-pre-difference
Treatment group	$\overline{Y}_B^T$	$\overline{Y}_A^T$	$(\overline{Y}_A^T - \overline{Y}_B^T)$
Control group	$\overline{Y}_B^C$	$\overline{Y}_A^C$	$(\overline{Y}_A^C - \overline{Y}_B^C)$
Treatment-comparison difference	$(\overline{Y}_B^T - \overline{Y}_B^C)$	$(\overline{Y}_A^T - \overline{Y}_A^C)$	Diff-in-Diff Estimate= $(\overline{Y}_A^T - \overline{Y}_B^T) - (\overline{Y}_A^C - \overline{Y}_B^C)$ $= (\overline{Y}_A^T - \overline{Y}_A^C) - (\overline{Y}_B^T - \overline{Y}_B^C)$

In **Supplemental Table 6**, $\overline{Y}_B^T$ represents PMPY expenditures (or utilization) of treatment group beneficiaries in the pre period of COVID-19 pandemic. The PMPY expenditures (or utilization) of treatment group beneficiaries in the post period is $\overline{Y}_A^T$. Similarly, $\overline{Y}_B^C$ represents PMPY

expenditures (or utilization) of comparison group beneficiaries in the pre period and $\bar{Y}_A^C$ represents PMPY expenditures (or utilization) of comparison group beneficiaries in the post period. The Difference-in-Differences effect is measured by $(\bar{Y}_A^T - \bar{Y}_B^T) - (\bar{Y}_A^C - \bar{Y}_B^C)$. The comparison group shows the counterfactual scenario (i.e., what would have happened had there been no treatment). Hence, we always compare the change in spending (or utilization) among the treatment group between two periods with that of the change among the comparison group to find the Difference-in-Differences estimate. We can also rearrange the terms in Difference-in-Differences estimator to get $(\bar{Y}_A^T - \bar{Y}_A^C) - (\bar{Y}_B^T - \bar{Y}_B^C)$. The term $(\bar{Y}_A^T - \bar{Y}_A^C)$ represents spending (or utilization) differences between treatment and comparison group beneficiaries in the post-period. Similarly, the term $(\bar{Y}_B^T - \bar{Y}_B^C)$ represents spending (or utilization) differences between treatment and comparison group beneficiaries in the pre-period. The difference between the two is the change in spending between treatment and comparison group beneficiaries due to COVID-19 pandemic. The magnitude of the difference determines how much total Medicare spending (or utilization) increases per member per year for the treatment group beneficiaries compared to the comparison group beneficiaries due to COVID-19 pandemic.

Difference-in-differences Regression Model:

Following is the general form of Difference-in-Differences (Diff-in-Diff) regression model to evaluate the effect of COVID-19 on total Medicare spending (or utilization) among FFS wound care Medicare beneficiaries. This model is used for the main analysis and sensitivity analyses. Although this is the linear form of the Diff-in-Diff estimation model, we have used GLM model (for spending) with Log-link function and Gamma Distribution to estimate the Difference-in-

Differences regression model. For the ED visit, we used two-part models and for Inpatient admissions, we used Logistic regression model.

$$\boldsymbol{Y_{it}} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1} * \boldsymbol{Treat_{it}} + \boldsymbol{\beta_2} * \boldsymbol{After_t} + \boldsymbol{\beta_3} * \boldsymbol{After_t} * \boldsymbol{Treat_{it}} + \boldsymbol{\beta_4} * \boldsymbol{X_{itc}} + \boldsymbol{\varepsilon_{it}}$$

Here, $\boldsymbol{Y_{it}}$ is the per member per year (PMPY) total Medicare expenditures for wound care beneficiary "i" and "t" is the time-period (pre- and post- periods).

The variable $\boldsymbol{Treat_{it}}$ is a dummy variable and indicates whether individual "i" has diagnosed with COVID-19 or not. More specifically, the variable "*Treat*" is equal to 1 if a wound care beneficiary is diagnosed with COVID-19. Otherwise, it is equal to 0 to signal that the beneficiary is in the comparison group.

The dummy variable $\boldsymbol{After_t}$ indicates post-period time dummy variable and it is equal to 1 when the time-period indicates post-COVID-19 period (2022-2023) and zero when the time-period indicates pre-COVID-19 period (2018-2019) for the main analysis. For the sensitivity analyses, post-period time dummy variable is equal to 1 when the time-period indicates 2020-2021 and zero otherwise (i.e., 2019). This time dummy captures any change in inflation over time-period. The vector $\boldsymbol{X_{itc}}$ includes all beneficiary level demographic information (age, gender, race and ethnicity, Medicare dual eligibility) and health status or severity of individuals (HCC scores), and geographic location factor (census regions).

Given this framework, the main coefficient of our interest is β_3, the estimated coefficient of the interaction between the dummy variables "*Treat*" and "*After*", also commonly referred to as the

difference-in-differences estimator. More specifically, it shows the changes in average spending among the treatment group beneficiaries (relative to the comparison group) due to COVID-19.

Given this framework and holding all other things constant, the changes in PMPY spending (or utilization) between pre and post intervention period for the treatment group is (β_2+ β_3). Similarly, the changes in the PMPY spending (or utilization) between pre and post period for the comparison group is β_2. Here, the comparison group shows the counterfactual scenario (i.e., what would have happened had there been no COVID-19 pandemic). Therefore, β_3 shows relative changes in the PMPY spending (or utilization) of the treatment group compared to the comparison group due to COVID-19 pandemic.

From IPTW propensity score model, we derived Average Treatment effect on Treated (ATT) weights. The ATT weight corresponding to each beneficiary is used in the Difference-in-Differences regression model. We performed Difference-in-Differences regression model using GLM with Log-link function and Gamma Distribution for all the spending metrices. In the Difference-in-Differences regression model we included demographic characteristics of patients (age, gender, race and ethnicity, dual eligibility), patient comorbidities (HCC scores) and geographical location factors (CMS census regions).

Regression Results from First Sensitivity Analysis

Supplemental Table 8 depicted the Difference-in-Differences regression results of GLM for all patients with chronic wounds. Only positive expenditures are used for the regression analyses and observations related to zero total spending are not used.

Supplemental Table 8. Difference-in-differences Regression Results of Expenditures by Service Type for All Patients With Chronic Wounds

Medicare expenditures by service categories	Difference-in-differences estimate	Standard errors	P-value	95% Confidence interval	
				LCB	UCB
Total Medicare expenditures	$4,172	$77	0.000	$4,021	$4,323
Physician's office	-$124	$9	0.000	-$143	-$106
Inpatient hospital	$4,228	$56	0.000	$4,118	$4,337
Outpatient hospital	-$360	$11	0.000	-$381	-$338
Durable medical equipment	-$115	$7	0.000	-$129	-$100
Skilled nursing facility	$836	$29	0.000	$779	$893
Home health	-$448	$13	0.000	-$473	-$423
Hospice	$169	$11	0.000	$147	$190

Note: Number of Observations: 10,925,668. LCB is Lower Confidence Bound and UCB is Upper Confidence Bound. All the regression results are statistically significant at 1%.

We estimated that in the short run (2019-2021), the chronic wound patients with COVID-19 diagnosis experienced an additional $4,172 higher PMPY total Medicare spending in the post period compared to chronic wound patients without COVID-19. This estimate suggests a 31% increase in PMPY spending compared to the pre-period mean spending ($13,500) of the treatment group.

Supplemental Table 9 showed Difference-in-Differences regression estimates of the three chronic wound categories (Diabetic foot ulcer, Pressure ulcer and Surgical wounds & infections).

Supplemental Table 9. Difference-in-differences (Diff-in-Diff) Regression Results of Expenditures by Service Type for Diabetic Foot Ulcer, Pressure Ulcer, and Surgical Wounds & Infections

	Diabetic foot ulcer	Pressure ulcer	Surgical wounds & infections
Medicare expenditures by service categories	**Diff-in-Diff estimates [standard error]**	**Diff-in-Diff estimates [standard error]**	**Diff-in-Diff estimates [standard error]**
***Total Medicare expenditures	$12,504	$5,124	$3,084
	[$428]	[$208]	[$182]
***Physician's office	-$155	-$262	-$163
	[$56]	[$25]	[$22]
***Inpatient hospital	$11,134	$6,570	$3,840
	[$306]	[$153]	[$133]
***Outpatient hospital	-$893	-$445	-$653
	[$76]	[$26]	[$25]
***Durable medical equipment	$138	-$207	-$494
	[$22]	[$15]	[$21]
***Skilled nursing facility	$2,784	$962	$985
	[$148]	[$74]	[$66]
***Home health	-$688	-$1,610	-$591
	[$73]	[$40]	[$26]
***Hospice	$186	$123	$123
	[$22]	[$29]	[$29]

Note: Number of observations for Diabetic Foot Ulcer is 575,927; for Pressure Ulcer is 1,704,568; and for Surgical wounds and infection is 4,495,673. All the regression results are statistically significant at 1% (shown by ***).

Among the three chronic wound types, diabetic foot ulcer patients showed highest increase in total PMPY spending ($12,504) due to pandemic related disruption in care services. Patients with Surgical wounds and infections experienced lowest increase in total PMPY spending ($3,084) due to pandemic related disruption in care services.

For the ED visit, we used two-part models. For Inpatient discharge, we used Logistic regression model. Finally, for mortality, we estimated a Logistic regression model in the post period.

Supplemental Table 10 shows the results on utilization and clinical outcomes for all patients with chronic wounds.

Supplemental Table 10. Regression Results of Utilization and Clinical Outcomes for All Patients with Chronic Wounds

Overall wound care services	**Regression estimates**	**Standard errors**	**P-value**	**95% Confidence interval**	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.614	0.010	0.000	0.595	0.633
***Inpatient admissions	0.146	0.001	0.000	0.144	0.148
***Mortality	0.026	0.0005	0.000	0.025	0.027

Note: Number of observations for overall wound care patients is 10,925,668; All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

In the short run, our Difference-in-Differences estimate on ED visits (0.614) suggested that treatment group experienced an additional 614 ED visits per 1,000 patients in the post COVID-19 period compared to comparison group. This indicated a 19% increase in ED visits compared to the pre-period average ED visits (3.16) of treatment group. We estimated that the likelihood of inpatient admission was 14.6 percentage points higher for the treatment group in the post period compared to the comparison group. This estimate suggested a 28% increase in inpatient admission rate compared to the pre-period mean inpatient admission rate (51.2%) of treatment group. Our estimates on mortality showed that COVID-19 diagnosed wound patients had 2.6 percentage points higher likelihood of mortality compared to without COVID-19 wound patients. This estimate suggested a 24% increase in mortality rate in the post period compared to the mean mortality rate (10.98%) of the comparison group.

Detailed regression results on all the utilization and mortality outcomes for the three chronic wound categories (diabetic foot ulcer, pressure ulcer and surgical wounds & infections) are shown in **Supplemental Table 10.1**, **Supplemental Table 10.2** and **Supplemental Table 10.3**.

Supplemental Table 10.1. Regression Results of Utilization and Clinical Outcomes for Diabetic Foot Ulcer Patients

Diabetic foot ulcer	Regression estimates	Standard errors	P-value	95% Confidence interval	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	1.083	0.045	0.000	0.996	1.171
***Inpatient admissions	0.155	0.004	0.000	0.147	0.163
***Mortality	0.02	0.0018	0.000	0.016	0.023

Note: Number of observations for Diabetic Foot Ulcer is 575,927. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

Supplemental Table 10.2. Regression Results of Utilization and Clinical Outcomes for Pressure Ulcer Patients

Pressure ulcer	Regression estimates	Standard errors	P-value	95% Confidence interval	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.651	0.02	0.000	0.612	0.69
***Inpatient admissions	0.148	0.003	0.000	0.143	0.153
***Mortality	0.028	0.002	0.000	0.024	0.033

Note: Number of observations for Pressure Ulcer is 1,704,568. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

Supplemental Table 10.3. Regression Results of Utilization and Clinical Outcomes for Surgical Wounds & Infections Patients

Surgical wounds and infections	Regression estimates	Standard errors	P-value	95% Confidence interval	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.735	0.022	0.000	0.691	0.778
***Inpatient admissions	0.117	0.002	0.000	0.113	0.121

***Mortality	0.03	0.001	0.000	0.028	0.031

Note: Number of observations for Surgical wounds and infection is 4,495,673. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period)

Second Sensitivity Analysis

We conducted second sensitivity analysis using a wound severity indicator variable (prior wound related hospitalization) and the existing covariates (age, gender, race and ethnicity, dual eligibility, HCC score, and census regions) in both the IPTW propensity score model and outcome models. We used the wound severity indicator variable to address any clinical heterogeneity. We also examined from our data that number of wound-related diagnosis is highly correlated with HCC score. Therefore, we did not include number of wound related diagnosis in the regression models.

The regression results of first and second sensitivity analyses in the short run (2019-2021) are similar in terms of all the outcome measures (spending, utilization and mortality). **Supplemental Table 11** depicts the Difference-in-Differences regression results of GLM for all patients with chronic wounds. Only positive expenditures are used for the regression analyses and observations related to zero total spending are not used.

Supplemental Table 11. Difference-in-differences Regression Results of Expenditures by Service Type for All Patients with Chronic Wounds

Medicare expenditures by service categories	Difference-in-differences estimate	Standard errors	P-value	95% Confidence interval	
				LCB	UCB
Total Medicare expenditures	$4,005	$85	0.000	$3,838	$4,172
Physician's office	-$136	$7	0.000	-$150	-$123
Inpatient hospital	$4,203	$59	0.000	$4,086	$4,319
Outpatient hospital	-$335	$8	0.000	-$351	-$319
Durable medical equipment	-$116	$5	0.000	-$126	-$105
Skilled nursing facility	$831	$33	0.000	$766	$895
Home health	-$414	$9	0.000	-$431	-$396
Hospice	$173	$13	0.000	$148	$198

Note: Number of Observations: 10,925,668. LCB is Lower Confidence Bound and UCB is Upper Confidence Bound. All the regression results are statistically significant at 1%.

We estimated that in the short run (2019-2021), the chronic wound patients with COVID-19 diagnosis experienced an additional $4,005 higher PMPY total Medicare spending in the post period compared to chronic wound patients without COVID-19. This estimate suggests a 30% increase in PMPY spending compared to the pre-period mean spending ($13,500) of the treatment group.

We also performed stratified analyses by three specific chronic wound types (e.g., pressure ulcers, diabetic foot ulcers, surgical wounds & infections) to examine which group has largest contribution in changing total expenditures and other care setting expenditures. Our second sensitivity results on three specific wound types are also similar to the first sensitivity analysis. **Supplemental Table 12** shows the Difference-in-Differences regression estimates of expenditures by service types for the three specific chronic wound categories.

Supplemental Table 12. Difference-in-differences (Diff-in-Diff) Regression Results of Expenditures by Service Type for Diabetic Foot Ulcer, Pressure Ulcer, and Surgical Wounds and Infections

	Diabetic foot ulcer	**Pressure ulcer**	**Surgical wounds & infections**
Medicare expenditures by service categories	**Diff-in-Diff estimates [standard error]**	**Diff-in-Diff estimates [standard error]**	**Diff-in-Diff estimates [standard error]**
***Total Medicare expenditures	$11,675	$4,868	$2,655
	[$437]	[$193]	[$182]
***Physician's office	-$161	-$253	-$150
	[$57]	[$22]	[$17]
***Inpatient hospital	$10,611	$6,523	$3,613
	[$315]	[$164]	[$135]
***Outpatient hospital	-$882	-$487	-$667
	[$76]	[$20]	[$25]
***Durable medical equipment	$126	-$210	-$491
	[$22]	[$11]	[$21]
***Skilled nursing facility	$2,628	$771	$868
	[$152]	[$78]	[$67]
***Home health	-$754	-$1,607	-$587
	[$74]	[$31]	[$18]
***Hospice	$184	$120	$118
	[$22]	[$29]	[$15]

Note: Number of observations for Diabetic Foot Ulcer is 575,927; for Pressure Ulcer is 1,704,568; and for Surgical wounds and infection is 4,495,673. All the regression results are statistically significant at 1% (shown by ***).

Like the first sensitivity analysis, we find that among these three specific chronic wound types, diabetic foot ulcer is the highest contributor in terms of increasing total PMPY expenditures followed by pressure ulcer and surgical wounds & infections. This result is also consistent with

our main regression result where we found that patients with diabetic foot ulcers are more disproportionately impacted by the pandemic related resource disruptions.

Regression results on utilization and mortality outcomes for the second sensitivity analysis are also similar to the first sensitivity analysis. Table 13 below depicts the utilization and mortality outcomes for all patients with chronic wounds.

Supplemental Table 13. Regression Results of Utilization and Clinical Outcomes for All Patients with Chronic Wounds

Overall wound care services	**Regression estimates**	**Standard errors**	**P-value**	**95% Confidence interval**	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.613	0.010	0.000	0.593	0.632
***Inpatient admissions	0.144	0.001	0.000	0.141	0.146
***Mortality	0.024	0.0005	0.000	0.023	0.025

Note: Number of observations for overall wound care patients is 10,925,668; All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

In the short run, our Difference-in-Differences estimate on ED visits (0.613) suggested that treatment group experienced an additional 613 ED visits per 1,000 patients in the post COVID-19 period compared to comparison group. This indicated a 19% increase in ED visits compared to the pre-period average ED visits (3.16) of treatment group. We estimated that the likelihood of inpatient admission was 14.4 percentage points higher for the treatment group in the post period compared to the comparison group. This estimate suggested a 28% increase in inpatient admission rate compared to the pre-period mean inpatient admission rate (51.2%) of treatment group. Our estimates on mortality showed that COVID-19 diagnosed wound patients had 2.4 percentage points higher likelihood of mortality compared to without COVID-19 wound patients.

This estimate suggested a 22% increase in mortality rate in the post period compared to the mean mortality rate (10.98%) of the comparison group.

All these results on second sensitivity analysis are similar to the first sensitivity analysis.

We also performed separate regression analyses on utilization and mortality metrics for the three specific chronic wound type patients. Following tables (**Supplemental Table 13.1**, **Supplemental Table 13.2**, and **Supplemental Table 13.3**) show the detailed regression results on utilization and mortality measures for diabetic foot ulcer, pressure ulcer and surgical wounds and infections.

Supplemental Table 13.1. Regression Results of Utilization and Clinical Outcomes for Diabetic Foot Ulcer Patients

Diabetic foot ulcer	**Regression estimates**	**Standard errors**	**P-value**	**95% Confidence interval**	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	1.034	0.045	0.000	0.946	1.122
***Inpatient admissions	0.148	0.004	0.000	0.139	0.156
***Mortality	0.02	0.002	0.000	0.013	0.020

Note: Number of observations for Diabetic Foot Ulcer is 575,927. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

Supplemental Table 13.2. Regression Results of Utilization and Clinical Outcomes for Pressure Ulcer Patients

Pressure ulcer	**Regression estimates**	**Standard errors**	**P-value**	**95% Confidence interval**	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.619	0.020	0.000	0.580	0.658

***Inpatient admissions	0.142	0.003	0.000	0.137	0.147
***Mortality	0.022	0.0004	0.000	0.022	0.023

Note: Number of observations for Pressure Ulcer is 1,704,568. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period).

Supplemental Table 13.3. Regression Results of Utilization and Clinical Outcomes for Surgical Wounds & Infections Patients

Surgical wounds and infections	**Regression estimates**	**Standard errors**	**P-value**	**95% Confidence interval**	
Utilization and clinical outcomes				**LCB**	**UCB**
***ED visits	0.723	0.022	0.000	0.679	0.767
***Inpatient admissions	0.110	0.002	0.000	0.107	0.114
***Mortality	0.03	0.001	0.000	0.025	0.028

Note: Number of observations for Surgical wounds and infection is 4,495,673. All the regression results are statistically significant at 1% (shown by ***). All the models are Difference-in-Differences regression models except Mortality (Logistic Regression model in post period)

Table 14 shows the ICD-10 codes and HCPCS (Healthcare Common Procedure Coding System) used to define 15 different chronic wounds for our study. The database was constructed using SAS Enterprise version 7.1 and the Econometric analyses were performed using STATA version 18.0.

Supplemental Table 14. ICD-10 and Health Care Common Procedure Codes for 15 Chronic Wounds

Venous
I83001,I83002,I83003,I83004,I83005,I83008,I83009,I83011,I83012,I83013,I83014,I83015,I83018,I83019,I83021,I83022,I83023,I83024,I83025,I83028,I83029,I8310,I8311,I8312,I83201,I83202,I83203,I83204,I83205,I83208,I83209,I83211,I83212,I83213,I83214,I83215,I83218,I83219,I83221,I83222,I83223,I83224,I83225,I83228,I83229,I87011,I87012,I87013,I87019,I8703

1,I87032,I87033,I87039,I87311,I87312,I87313,I87319,I87331,I87332,I873
33,I87339,I87391,I87392,I87393,I87399

Pressure Ulcer

L89000,L89001,L89002,L89003,L89004,L89006,L89009,L89010,L89011,L89012
,L89013,L89014,L89016,L89019,L89020,L89021,L89022,L89023,L89024,L8902
6,L89029,L89100,L89101,L89102,L89103,L89104,L89106,L89109,L89110,L891
11,L89112,L89113,L89114,L89116,L89119,L89120,L89121,L89122,L89123,L89
124,L89126,L89129,L89130,L89131,L89132,L89133,L89134,L89136,L89139,L8
9140,L89141,L89142,L89143,L89144,L89146,L89149,L89150,L89151,L89152,L
89153,L89154,L89156,L89159,L8940,L8941,L8942,L8943,L8944,L8945,L8946,
L89200,L89201,L89202,L89203,L89204,L89206,L89209,L89210,L89211,L89212
,L89213,L89214,L89216,L89219,L89220,L89221,L89222,L89223,L89224,L8922
6,L89229,L89310,L89311,L89312,L89313,L89314,L89316,L89319,L89320,L893
21,L89322,L89323,L89324,L89326,L89329,L89500,L89501,L89502,L89503,L89
504,L89506,L89509,L89510,L89511,L89512,L89513,L89514,L89516,L89519,L8
9520,L89521,L89522,L89523,L89524,L89526,L89529,L89600,L89601,L89602,L
89603,L89604,L89606,L89609,L89610,L89611,L89612,L89613,L89614,L89616,
L89619,L89620,L89621,L89622,L89623,L89624,L89626,L89629,L89810,L89811
,L89812,L89813,L89814,L89816,L89819,L89890,L89891,L89892,L89893,L8989
4,L89896,L89899,L8990,L8991,L8992,L8993,L8994,L8995,L8996

Chronic Ulcer

L97901,L97902,L97903,L97904,L97905,L97906,L97908,L97909,L97911,L97912
,L97913,L97914,L97915,L97916,L97918,L97919,L97921,L97922,L97923,L9792
4,L97925,L97926,L97928,L97929,L97101,L97102,L97103,L97104,L97105,L971
06,L97108,L97109,L97111,L97112,L97113,L97114,L97115,L97116,L97118,L97
119,L97121,L97122,L97123,L97124,L97125,L97126,L97128,L97129,L97201,L9
7202,L97203,L97204,L97205,L97206,L97208,L97209,L97211,L97212,L97213,L
97214,L97215,L97216,L97218,L97219,L97221,L97222,L97223,L97224,L97225,
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Surgical Wound

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Skin disorder

E201, E8359, L88, L589, L120, L128, L138, L139, L52, L26, L304, L538, L920, L951, L982, L732, L959, L921, L942, L988, L989, M3303, M3313, M3390, M3393, Q819, Q826, Q828, T66XXXA, T3309XA, T3409XA, T33529A, T34529A, T33829A, T33839A, T34829A, T3390XA, T3399XA, T3490XA, T3499XA

Traumatic wound

S21101A,S21102A,S21109A,S21121A,S21122A,S21129A,S21201A,S21202A,S21209A,S31000A,S31020A,S31801A,S31802A,S31803A,S31805A,S31809A,S3120XA,S3121XA,S3123XA,S3125XA,S38221A,S38222A,S3130XA,S3131XA,S3133XA,S3135XA,S3140XA,S3141XA,S3143XA,S3145XA,S31501A,S31502A,S21009A,S31102A,S31105A,S31109A,S41001A,S41002A,S41009A,S41101A,S41102A,S41109A,S51801A,S

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Claim has both S51809A and S56929A
Claim has both S51009A and S56929A
Claim has both S91309A and S96929A

Burn

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T300,T304

Surgical infection

A422,B469,K610,K611,K613,N610,N611,L0202,L0203,L0212,L0213,L02221,L02
222,L02223,L02224,L02225,L02226,L02229,L02231,L02232,L02233,L02234,L0
2235,L02236,L02239,L02429,L02439,L02529,L02539,L0232,L0233,L02821,L02
828,L02831,L02838,L0292,L0293,L03011,L03012,L03019,L03021,L03022,L030

29,L03039,L03049,K122,L0201,L03211,L03212,L03213,L0211,L03221,L03222,
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,L03323,L03324,L03325,L03326,L03327,L03329,L03111,L03112,L03113,L0311
4,L03119,L03121,L03122,L03123,L03124,L03129,L03317,L03811,L03818,L038
91,L03898,L0390,L0391,T798XXA,T8450XA,K6811,T8140XA,T8141XA,T8142XA,T
8143XA,T8144XA,T8149XA

Diabetes infection

A311, L081, B951, L02429, L02439, L02629, L02639, L03011, L03012, L03019, L03031, L03032, L03039, L03041, L03042, L03049, L03115, L03116, L03119, L03125, L03126, L03129, M86661, M86662, M86669, M86671, M86672, M86679, T8460XA, T847XXA, T8579XA, T8740

Venous infection

E832, L0889, L089

Skin diseases

B479, L080, L0889

Arterial

I7025,I70261,I70262,I70263,I70268,I70269,L97101,L97102,L97103,L97104,
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,L97208,L97209,L97301,L97302,L97303,L97304,L97305,L97306,L97308,L9730
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02,L97503,L97504,L97505,L97506,L97508,L97509,L97801,L97802,L97803,L97
804,L97805,L97806,L97808,L97809,L98499

Diabetic Foot = claim must have both Diabetic Foot 1 and Diabetic Foot 2

Diabetic Foot 1

L97301,L97302,L97303,L97304,L97305,L97306,L97308,L97309,L97311,L97312
,L97313,L97314,L97315,L97316,L97318,L97319,L97321,L97322,L97323,L9732
4,L97325,L97326,L97328,L97329,L97401,L97402,L97403,L97404,L97405,L974
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419,L97421,L97422,L97423,L97424,L97425,L97426,L97428,L97429,L97501,L9
7502,L97503,L97504,L97505,L97506,L97508,L97509,L97511,L97512,L97513,L
97514,L97515,L97516,L97518,L97519,L97521,L97522,L97523,L97524,L97525,
L97526,L97528,L97529

Diabetic foot 2

E089,E099,E139,E0865,E0965,E0810,E0910,E1310,E0801,E0901,E1300,E0811,
E08641,E0911,E09641,E1311,E13641,E0821,E0921,E08311,E08319,E0836,E083
9,E09311,E09319,E0936,E0939,E1339,E0840,E0841,E0842,E0843,E0844,E0849
,E08610,E0940,E0941,E0942,E0943,E0944,E0949,E09610,E1340,E1341,E1342,

E1343,E1344,E1349,E0851,E0951,E1359,E08618,E08620,E08621,E08622,E0862
8,E08630,E08638,E0865,E0869,E09618,E09620,E09621,E09622,E09628,E09630
,E09638,E09649,E0965,E0969,E13620,E13621,E13622,E13628,E13638,E13649,
E1365,E1369,E0869,E0969,E088,E098,E138,E088,E098,E119,E109,E1165,E106
5,E1110,E1169,E1010,E1100,E1101,E1069,E11641,E1011,E10641,E1129,E1029
,E1121,E1021,E11311,E11319,E1136,E1139,E10311,E10319,E1036,E1039,E106
5,E1140,E1040,E1151,E1051,E11618,E11620,E11621,E11622,E11628,E11630,E
11638,E11649,E1165,E1169,E10618,E10620,E10621,E10622,E10628,E10630,E1
0638,E10649,E1069,E118,E108

Radiation late

L599, L589, T66XXXA, N3041, N3040, K627, W888XXA, M272, M278

Other Chronic Wounds

I80241,I80242,I80243,I80249,I80251,I80252,I80253,I80259,I82451,I82452
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9,I82561,I82562,I82563,I82569,L89006,L89016,L89026,L89106,L89116,L891
26,L89136,L89146,L89156,L89206,L89216,L89226,L89306,L89316,L89326,L89
46,L89506,L89516,L89526,L89606,L89616,L89626,L89816,L89896,L8996

HCPCS [from outpatient, physician, and DME files]

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