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Cost-effectiveness of skin biopsies performed by non-physician clinicians for Medicare beneficiaries

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Abstract

An increasing number of non-physician clinicians (NPCs) are providing dermatologic care. We compared the cost-effectiveness of skin biopsies performed by dermatologists and dermatology NPCs using publicly-available Medicare claims data and numbers needed to biopsy (NNBs) published in the literature. We estimated that dermatology NPCs performed slightly greater mean numbers of skin biopsies per beneficiary (0.51 versus 0.47) at a lower payment per *biopsy* (\$44.93 versus \$55.10) as compared to dermatologists. However, we estimated a higher mean cost per *malignancy* diagnosed by dermatology NPCs relative to dermatologists (range based on literature NNB values, \$39.08 to \$190.23). This translated to a \$16.7M–\$43.3M aggregate cost of additional, benign biopsies performed by NPCs on Medicare beneficiaries. Although this preliminary analysis has several limitations, including the reliance on NNB values for calculations, it likely highlights the importance of training, education, and supervision to promote diagnostic accuracy. Further investigation is needed so that the potential cost of additional skin biopsies performed by NPCs can be appropriately weighed against the improvement in dermatologic access by including NPCs in the dermatology workforce.

Keywords: beneficiaries, biopsy, cost-effectiveness, dermatologists, Medicare, non-physician clinicians, number needed to biopsy, nurse practitioners, physician assistants

Introduction

As the demand for dermatologic services has increased, a greater number of non-physician clinicians (NPCs), including physician assistants (PAs) and nurse practitioners (NPs), are delivering care [1]. Given that the cost-effectiveness of dermatologic services by NPCs remains insufficiently evaluated, we utilized publicly available Medicare data and numbers needed to biopsy (NNBs) from retrospective, large-institution studies to assess the cost-effectiveness of biopsies performed *independently* by dermatology NPCs among Medicare beneficiaries [2,3].

We filtered the 2017 Medicare Public Use File by Healthcare Common Procedure Coding System (HCPCS) 11100–11101 to identify skin biopsies performed by dermatologists and dermatology NPCs [4]. We compared the mean payment per identified *malignancy* among dermatologists and dermatology NPCs, which was calculated for several malignancy types by multiplying the mean procedural and pathology payments per *biopsy* by the respective clinician NNB. Pathology payments corresponded to HCPCS 88305 and included technical and professional components. The NNB ratio between clinician types was then used to define the *number* of “additional” benign biopsies and was multiplied by the mean payment per biopsy to yield an *aggregate annual cost*.

We also summarized similar statistics for primary care physicians (PCPs) for comparative purposes.

Dermatology NPCs were defined as NPs and PAs who independently billed for >10 common dermatologic services (skin repairs, destructions, biopsies, excisions) and did *not* bill for services commonly associated with other specialties. Primary care physicians included family practice and internal medicine physicians.

This study utilized publicly available online datasets and did not qualify as human subject research; therefore, institutional review board approval was not required at the University of Connecticut Health Center.

Discussion

Dermatology NPCs performed slightly greater mean biopsies per beneficiary (0.51 versus 0.47) at a lower payment per biopsy (\$44.93 versus \$55.10) as compared to dermatologists. A minority (0.5%) of PCPs performed a small number of mean biopsies per beneficiary (0.11). By incorporating literature NNBs from a scenario that assumed a mixture of skin malignancy types, we estimated a higher mean cost per malignancy diagnosed by dermatology NPCs relative to dermatologists (range, \$39.08 to \$190.23), ([Table 1](#)).

The number of NPCs independently performing biopsies has increased substantially (+52.2%) as compared to a 2014 [1]. Compared to dermatologists, dermatology NPCs had greater per-beneficiary biopsy rates. Although the Medicare fee schedule provides lower biopsy payment rates to NPCs than physicians [1], the NNB also influences the cost-effectiveness of skin biopsies performed by NPCs.

The slightly higher NNBs for non-melanoma skin cancers (NMSCs) performed by NPCs and PCPs yields a marginally higher payment per NMSC diagnosed by these clinicians [2,3]. Provider differences in NNBs for *pigmented* lesions are more substantial [3], imparting a notably greater cost per melanoma identified by non-dermatologists. This difference may be driven by melanoma in situ diagnoses, in which discerning the clinical presentation can require advanced training [5].

These differences likely highlight the importance of training, supervision, and experience, which could improve diagnostic accuracy and cost-effectiveness [6]. The analysis also suggests that there may be regional variations in the number of NPCs independently performing skin biopsies. Despite also demonstrating a higher overall NNB, PCPs infrequently performed biopsies and contributed a smaller additional cost.

Conclusion

This analysis estimated a \$16.7M–\$43.3M aggregate cost of additional, benign biopsies performed by NPCs on Medicare beneficiaries. However, there are several shortcomings. The reliance on NNB values for the cost-effectiveness assessment is imperfect as NNB values are also influenced by characteristics of patient populations, which likely differ across clinician types. There may also be significant heterogeneity in diagnostic skill *among* NPCs, which is not captured here. Additionally, some biopsies may be performed at the request of the patient rather than due to clinical concern from the clinician. These and other limitations are more closely addressed in [Table 2](#).

Given limitations, the final estimates should be interpreted with caution and this assessment should encourage more rigorous analyses to comprehensively compare cost-effectiveness across clinician types and guide policy decisions. Cost should also be considered alongside the personal impact of additional biopsies on patients' physical and emotional health. Ultimately, the healthcare costs that can result from potential overutilization of services such as skin biopsies must be weighed against the potential improvement in dermatologic access by including NPCs in the dermatology workforce.

Potential conflicts of interest

Hao Feng has consulted for Cytrellis Biosystems, Inc. and Soliton, Inc. The remaining authors declare no conflicts of interest.

References

1. Adamson AS, Suarez EA, McDaniel P, et al. Geographic Distribution of Nonphysician Clinicians Who Independently Billed Medicare for Common Dermatologic Services in 2014. *JAMA Dermatol.* 2018;154:30-6. [PMID: 29167867].
2. Anderson AM, Matsumoto M, Saul MI, et al. Accuracy of Skin Cancer Diagnosis by Physician Assistants Compared With Dermatologists in a Large Health Care System. *JAMA Dermatol.* 2018;154:569-73. [PMID: 29710082].
3. Privalle A, Havighurst T, Kim K, et al. Number of skin biopsies needed per malignancy: Comparing the use of skin biopsies among dermatologists and nondermatologist clinicians. *J Am Acad Dermatol.* 2020;82:110-6. [PMID: 31408683].
4. Physician and Other Supplier Public Use File, CY2017 [Internet]2017. Available from: <https://data.cms.gov/Medicare-Physician-Supplier/Medicare-Physician-and-Other-Supplier-National-Pro/n5qc-ua94>. Accessed on January 12, 2021.
5. Qi Q, Hibler BP, Coldiron B, Rossi AM. Analysis of Dermatologic Procedures Billed Independently by Non-Physician Practitioners in the United States. *J Am Acad Dermatol.* 2018. [PMID: 30227192].
6. Nelson KC, Swetter SM, Saboda K, et al. Evaluation of the Number-Needed-to-Biopsy Metric for the Diagnosis of Cutaneous Melanoma: A Systematic Review and Meta-analysis. *JAMA Dermatol.* 2019. [PMID: 31290958].

Table 1. Comparative estimates of biopsy cost-effectiveness among dermatologists, NPCs, and PCPs in the Medicare population.

Clinician Characteristic or Measure	Dermatologists (N=10,773)	Dermatology NPCs (N=4,433)	PCPs (N=182,316)
Provider and biopsy summary data			
Providers performing biopsies (%)	10,313 (95.7)	4,041 (91.2)	961 (0.5)
Female (%)	48.5	82.8	17.7
Region of practice (%)			
Northeast	21.8	18.8	20.8
Midwest	19.0	20.3	23.4
South	35.8	39.9	34.5
West	22.9	21.0	20.8
Total biopsies performed	3,667,811	939,946	58,010
Mean biopsies per beneficiary managed	0.47	0.51	0.11
Biopsy payment summary data			
Total biopsy procedural payments	\$202,078,496	\$43,170,168	\$3,240,172
Mean procedural payment per biopsy	\$55.10	\$45.93	\$55.86
Pathology payment per biopsy	\$69.62	\$69.62	\$69.62
Mean total payment per biopsy (Proc. + Path)	\$124.72	\$115.55	\$125.48
Comparative estimates of biopsy cost-effectiveness			
Nmsc – lower estimate:			
<i>NNB literature value [2]</i>	1.61	1.66	NR*
Mean payment per malignancy (Proc. + Path.)	\$200.79	\$191.81	–
Nmsc – upper estimate:			
<i>NNB literature value [3]</i>	2.00	2.71	2.36
Mean payment per malignancy (Proc. + Path.)	\$249.43	\$313.14	\$296.13
Melanoma – lower estimate:			
<i>NNB literature value [3]</i>	14.33	20.78	27.80
Mean payment per malignancy (Proc. + Path.)	\$1,787.17	\$2,401.09	\$3,488.34
Melanoma – upper estimate:			
<i>NNB literature value [2]</i>	25.40	39.40	NR*
Mean payment per malignancy (Proc. + Path.)	\$3,167.76	\$4,552.60	–
All skin cancers – lower estimate:			
<i>NNB literature value [2]</i>	3.30	3.90	NR*
Mean payment per malignancy (Proc. + Path.)	\$411.56	\$450.64	–
Number of excess biopsies	Reference	144,607	–
Aggregate cost of excess biopsies (Proc. + Path.)	Reference	\$16,709,109	–
All skin cancers – upper estimate:			
<i>NNB literature value [3]</i>	2.82	4.69	4.55
Mean payment per malignancy (Proc. + Path.)	\$351.70	\$541.92	\$570.93
Number of excess biopsies	Reference	374,775	22,057
Aggregate cost of excess biopsies (Proc. + Path.)	Reference	\$43,304,737	\$2,767,655

HCPCS, healthcare common procedure coding system; NMSC, non-melanoma skin cancer; NNB, number needed to biopsy; NP, nurse practitioner; NPC, non-physician clinician; NR, not reported (in the specific literature study for the respective clinician group); PA, physician assistant; PCP, primary care physician; SD, standard deviation.

The table denotes provider characteristics, skin biopsy data, and estimates of cost-effectiveness for skin biopsies for dermatologists, non-physician clinicians, and primary care physicians performing biopsies among Medicare dermatology beneficiaries.

Summary Data: Biopsy and payment means are calculated as: (total biopsies or payments)÷(total respective clinicians or beneficiaries) for each clinician group. As weighted means, these values do not have an associated standard deviation or P value for statistical differences across groups.

Cost-Effectiveness Assessment: *Italicized values indicate literature NNB estimates. Non-italicized values indicate calculations using Medicare data and literature estimates.* Mean payment per identified malignancy is calculated for each clinician group and malignancy type by multiplying the mean payment per biopsy by the literature NNB for the respective clinician group. Aggregate additional cost estimates were calculated for a scenario of mixed skin malignancies using NNB literature approximations in which the ratio of NMSC to melanoma was ~9:1. The NNB ratio between NPCs/PCPs and dermatologists was used to define the number of “additional” biopsies that do not identify a malignancy and was multiplied by the mean payment per biopsy for the respective provider group to yield an aggregate cost of these additional biopsies.

Table 2. Summary of major limitations in the study methodology and their potential impact.

Topic	Limitation description	Potential impact on conclusions
Impact of patient and provider characteristics on NNB	Literature NNB values were derived in a clinical setting in which the NMSC-to-melanoma ratio was ~9:1	This cost-effectiveness assessment yields <i>generalized</i> approximations for the overall Medicare population and does not account for variability in skin cancer rates or provider characteristics by clinical setting; the external validity of these findings in a particular clinical setting cannot be established
	NNB values may be smaller in populations with a higher overall skin cancer prevalence and also vary depending on provider characteristics (e.g., risk tolerance)	
Impact of clinical billing practices on NNB	Differences in coding by clinical practice (e.g., coding the removal of an irritated benign lesion per patient request as a shave removal versus biopsy) may influence the NNB at the respective practice	Frequent coding of shave removals as biopsies may inappropriately increase the NNB estimates as well as the overall biopsy volume and therefore limit the validity of the final cost-effectiveness estimates
Provider biopsy sensitivity and specificity	Biopsy sensitivity and specificity are clinician characteristics that remain consistent across clinical settings and may provide a more accurate indication of diagnostic accuracy as compared to NNBs, yet are rarely reported in literature for all clinician groups	Further corroboration of the current cost-effectiveness estimates with biopsy sensitivity and specificity values is warranted in order to verify that the NNB differences are not simply due to varying clinical settings and patient populations across provider types
Incident-to billing by NPCs	The data specifically assess biopsies performed <i>independently</i> by NPCs (without dermatologist supervision) and do <i>not</i> assess “incident-to” billing, in which a biopsy performed by an NPC would be verified and ultimately billed for by an attending dermatologist	Additional biopsy volume by NPCs under dermatologist supervision may add an additional cost that is not accounted for in this study; the final cost-effectiveness estimates may therefore be slightly conservative
Single payor (Medicare Fee-For-Service)	The current study assesses Medicare fee-for-service data; Medicaid and additional commercial payors likely reimburse for biopsies at differing rates	The conclusions should be interpreted in the context of a Medicare fee-for-service population; cost-effectiveness of NPCs, PCPs, and dermatologists may differ under other payor types and reimbursement models and cannot be specifically assessed by these data
Heterogeneity among NPCs	NPCs are considered as a single group in this study to be consistent with most literature NNB estimates; however, diagnostic ability of NPCs may be influenced by type of advanced degree (NP versus PA), years of experience, type of clinical experience, and type of physician supervision	The conclusions draw from a <i>generalized</i> approximation of cost-effectiveness for all dermatology NPCs; clinicians with more rigorous training, greater supervision, increased experience may demonstrate greater individual degrees of cost-effectiveness

NMSC, non-melanoma skin cancer; NNB, number needed to biopsy; NP, nurse practitioner; NPC, non-physician clinician; PA, physician assistant; PCP, primary care physician.

The table outlines the major shortcomings of the comparative cost-effectiveness assessment. The potential impact of each limitation on the conclusions is highlighted.