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# Differences in Rate of Complete Excision of Basal Cell Carcinoma by Dermatologists, Plastic Surgeons and General Practitioners: A Large Cross-Sectional Study

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## Keywords

Margins of excision · Basal cell carcinoma · Medicine · Physicians · Quality of health care · Comparative study · Surgery · General practitioners · Dermatologists · Plastic surgeons

## Abstract

**Background:** Due to the increasing incidence of basal cell carcinoma (BCC) and rising health care costs, health care insurance companies seek ways to shift skin surgery for BCC from secondary to primary care. **Objectives:** To study the differences in complete excision of BCC by general practitioners (GPs), dermatologists, and plastic surgeons. **Methods:** A retrospective cross-sectional study of pathology records of 2,986 standard excisions of primary BCCs performed by a GP, dermatologist, or plastic surgeon in the area of Southwest

Netherlands between 2008 and 2014. To compare the risk of an incomplete BCC excision between the specialties, the odds ratio (OR) was used adjusted for patient age, sex, tumor site, size, and histological subtype. **Results:** BCCs were completely excised by GPs in 70%, which was lower than the 93% by dermatologists and 83% by plastic surgeons ( $p < 0.001$ ). Compared to the dermatologist, BCCs which were excised by a GP were 6 times higher at risk of an incomplete excision (adjusted OR 6, 95% CI 5–8) and 2 times higher at risk when excised by a plastic surgeon (adjusted OR 2, 95% CI 2–3). **Conclusion:** BCCs were more often completely excised by dermatologists than by GPs and plastic surgeons. Dermatologists probably perform better because of their extensive training and high experience in BCC care. To minimize incomplete BCC excision, GPs should receive specific training before the shift of BCC care from secondary to primary care is justifiable.

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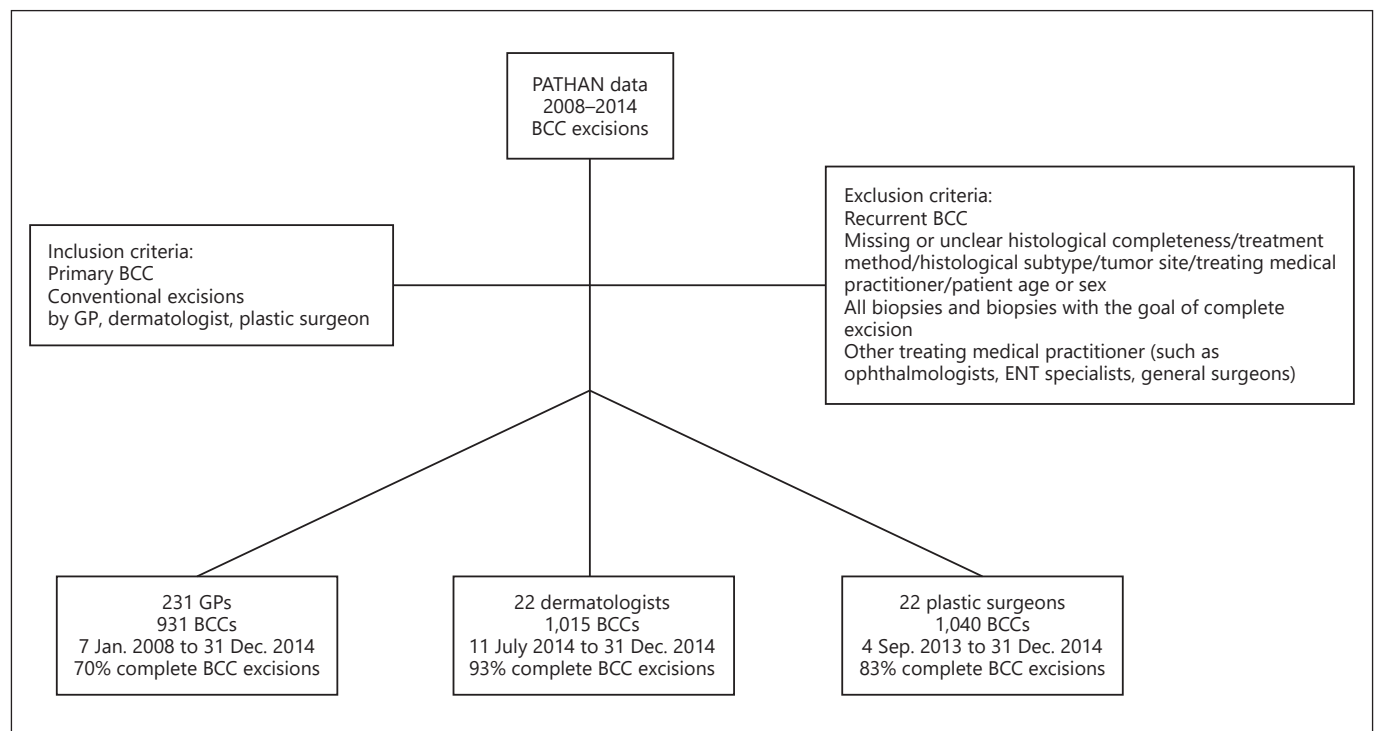
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## Introduction

Basal cell carcinoma (BCC) is the most common cancer in the Netherlands. According to the Netherlands Cancer Registry, the BCC incidence rate is about 40,000 per year with an increase of 5% each year [1]. In the Netherlands, patients initially visit a general practitioner (GP) for their skin lesions. The GPs decide whether to treat the patient themselves or to refer to a specialist. Although Dutch GPs are not specifically trained in skin tumor care (unlike counterparts in the UK and Australia), they do excise 27% of the benign skin tumors they encounter and 31% of the skin tumors they suspect to be malignant [2, 3]. If GPs refer a patient with a skin tumor, this is most often to a dermatologist or plastic surgeon, and less often to an ophthalmologist, general surgeon or ear-nose-and-throat specialist. In the Netherlands, until June 2017, a specific BCC guideline for GPs was lacking, while specialists could refer to their multidisciplinary conducted Dutch BCC guideline since 2002. Adherence to guidelines, however, might vary within and between specialists, which may result in different treatment choices and quality of care. According to the Dutch BCC guideline, the first choice of treatment for BCC is a standard excision,

with a clinical tumor-free excision margin of 3 mm for nonaggressive BCC subtypes (i.e., nodular and superficial) <2 cm and a 5-mm margin for larger BCCs or BCCs with an aggressive histological subtype (i.e., infiltrative or micronodular) [4]. Incompletely excised BCCs need re-excision to prevent recurrence, as recurrent BCCs can be more aggressive and therefore more difficult to treat, leading to impaired functional and cosmetic outcome for patients and higher costs for society.

Health insurance companies and governments worldwide promote a shift of minor skin surgery from secondary to primary care in order to reduce health care costs [5–7]. Accordingly, the Dutch Collaborating Centre of the WHO promotes a shift of BCC care, even though it is unknown whether the quality of BCC care among GPs is sufficient compared to medical specialists. The quality of BCC care among GPs and medical specialists needs to be carefully assessed, as quality of care should not be compromised in order to reduce costs. One of the indicators for the quality of BCC care is the rate of completely excised BCCs. This retrospective cross-sectional study of pathology records compared the rate of completely excised BCCs between GPs, dermatologists, and plastic surgeons in the Netherlands.



**Fig. 1.** Flowchart of Material and Methods.

**Table 1.** A comparison of patient characteristics and number of complete basal cell carcinoma excisions between specialties, with subdivisions per site and histopathological subtype

	GP, <i>n</i> (%)	DE, <i>n</i> (%)	PS, <i>n</i> (%)	Specialties combined, <i>n</i> (%)	GP, DE, PS <i>p</i> value	GP vs. DE <i>p</i> value	PS vs. DE <i>p</i> value
Excisions, <i>n</i>	931	1,015	1,040	2,986			
Physicians, <i>n</i>	231	22	22	275			
Patients							
Age (mean $\pm$ SD), years	67 $\pm$ 13	70 $\pm$ 12	69 $\pm$ 14	69 $\pm$ 13	<0.001		
Male	468 (50)	608 (60)	469 (45)	1,545 (52)	<0.001	<0.001	<0.001
Complete excisions total	649 (70)	946 (93)	867 (83)	2,462 (82)	<0.001	<0.001	<0.001
Per site							
Head/neck	173 (56)	414 (89)	638 (80)	1,225 (78)	<0.001	<0.001	<0.001
Trunk	299 (78)	356 (97)	126 (93)	781 (88)	<0.001	<0.001	0.062
Limbs	177 (74)	176 (96)	103 (95)	458 (86)	<0.001	<0.001	0.501
Per subtype							
Nodular	305 (73)	441 (96)	386 (89)	1,132 (86)	<0.001	<0.001	<0.001
Superficial	129 (81)	212 (94)	102 (92)	443 (90)	<0.001	<0.001	0.417
Infiltrative	33 (45)	49 (88)	79 (69)	161 (66)	<0.001	<0.001	0.008
Mixed nonagg. <sup>1</sup>	58 (67)	90 (90)	58 (74)	206 (78)	0.001	<0.001	0.006
Mixed agg. <sup>2</sup>	124 (64)	154 (89)	242 (80)	520 (78)	<0.001	<0.001	0.015
<i>Per site/per subtype</i>							
Head/neck							
Nodular	112 (65)	238 (93)	323 (87)	673 (84)	<0.001	<0.001	0.022
Superficial	3 (50)	31 (89)	28 (80)	62 (82)	0.075		
Infiltrative	9 (24)	28 (82)	65 (65)	102 (59)	<0.001	<0.001	0.058
Mixed nonagg.	6 (38)	32 (87)	35 (69)	73 (70)	0.002	<0.001	0.052
Mixed agg.	43 (56)	85 (83)	187 (78)	315 (75)	<0.001	<0.001	0.334
Trunk							
Nodular	143 (82)	143 (99)	34 (97)	320 (90)	<0.001	<0.001	0.275
Superficial	62 (83)	134 (97)	44 (98)	240 (93)	<0.001	<0.001	0.809
Infiltrative	19 (79)	15 (94)	8 (100)	42 (87)	0.198		
Mixed nonagg.	27 (68)	31 (86)	14 (88)	72 (78)	0.089		
Mixed agg.	48 (69)	33 (100)	26 (84)	107 (80)	0.001	<0.001	0.016
Limbs							
Nodular	50 (69)	60 (98)	29 (97)	139 (85)	<0.001	<0.001	0.604
Superficial	64 (82)	47 (90)	30 (97)	141 (88)	0.083		
Infiltrative	5 (46)	6 (100)	6 (86)	17 (71)	0.036		
Mixed nonagg.	25 (83)	27 (100)	9 (82)	61 (90)	0.076		
Mixed agg.	33 (70)	36 (97)	29 (97)	98 (86)	<0.001	0.001	0.880

Percentages were rounded. GP, general practitioner; DE, dermatologist; PS, plastic surgeon; nonagg., nonaggressive; agg., aggressive.  
<sup>1</sup> Mixed nonaggressive basal cell carcinomas were superficial with nodular type (*n* = 264). <sup>2</sup> Mixed aggressive basal cell carcinomas (*n* = 668) were: superficial with infiltrative (*n* = 48), superficial with nodular and infiltrative (*n* = 67), nodular with infiltrative (*n* = 544), and infiltrative with micronodular type (*n* = 9).

## Materials and Methods

For further details, see the online supplementary material (see [www.karger.com/doi/10.1159/000490344](http://www.karger.com/doi/10.1159/000490344) for all online suppl. material) (Fig. 1).

## Results

In total 2,986 pathology records of BCC excisions were included. The patients' median age was 69 years (SD  $\pm$ 13 years), and 52% were male. Of the 2,986 BCCs, 931 were excised by a GP (*n* = 231) in a period of 6 years, 1,015 by a dermatologist (*n* = 22) in a period of 6 months, and

**Table 2.** Risk of incomplete basal cell carcinoma (BCC) excision between specialties, adjusted for tumor and patient characteristics

Category	Variable	Univariable analysis		Multivariable analysis	
		OR (95% CI) for incomplete BCC excision	<i>p</i> value	OR (95% CI) for incomplete BCC excision	<i>p</i> value
Specialty	Dermatologist	ref.			
	General practitioner	6.0 (4.5–7.9)	<0.0001	6.2 (4.6–8.4)	<0.0001
	Plastic surgeon	2.7 (2.0–3.7)	<0.0001	2.0 (1.5–2.7)	<0.0001
Tumor characteristics	Trunk	ref.			
	Head/neck	2.1 (1.7–2.7)	<0.0001	2.7 (2.0–3.6)	<0.0001
	Limbs	1.2 (0.9–1.7)	0.248	1.1 (0.8–1.5)	0.605
	≤2.5 cm	Ref.			
	>2.5 cm	0.3 (0.2–0.4)	<0.0001	0.4 (0.3–0.5)	<0.0001
	Nodular	Ref.			
	Superficial	0.7 (0.5–1.0)	0.055	1.3 (0.9–1.9)	0.146
	Infiltrative	3.2 (2.4–4.3)	<0.0001	3.4 (2.4–4.7)	<0.0001
	Mixed nonaggressive <sup>1</sup>	1.7 (1.3–2.4)	<0.001	2.6 (1.8–3.7)	<0.0001
	Mixed aggressive <sup>2</sup>	1.8 (1.4–2.2)	<0.0001	2.0 (1.6–2.6)	<0.0001
Patient characteristics	Male	Ref.			
	Female	1.1 (0.9–1.4)	0.207	1.0 (0.8–1.2)	0.768
	Age (for a difference of 1 year)	1.0 (1.0–1.0)	0.074	1.0 (1.0–1.0)	0.069

Percentages were rounded. OR, odds ratio; CI, confidence interval; BCC, basal cell carcinoma. <sup>1</sup> Mixed non-aggressive BCCs were superficial with nodular type ( $n = 264$ ). <sup>2</sup> Mixed aggressive BCCs ( $n = 668$ ) were: superficial with infiltrative ( $n = 48$ ), superficial with nodular and infiltrative ( $n = 67$ ), nodular with infiltrative ( $n = 544$ ), and infiltrative with micronodular type ( $n = 9$ ).

1,040 by a plastic surgeon ( $n = 22$ ) in a period of 15 months (Table 1).

Overall, BCCs were completely excised in 82% (2,462/2,986) (Table 1). BCCs were completely excised by GPs in 70% (649/931), which was lower than the 93% (946/1,015) by dermatologists, and 83% (867/1,040) by plastic surgeons ( $p < 0.001$ ). Compared to the dermatologist, BCCs which were excised by a GP were 6 times higher at risk of an incomplete excision (adjusted OR 6, 95% CI 5–8) and 2 times higher at risk when excised by a plastic surgeon (adjusted OR 2, 95% CI 2–3) ( $p < 0.0001$ ) (Table 2). The risk of an incomplete excision was higher for small BCCs (adjusted OR 0.4, 95% CI 0.3–0.5,  $p < 0.0001$ ). The risk of an incomplete BCC excision was not increased by patients' age or sex.

#### *BCCs of the Head and Neck*

BCCs of the head and neck were completely excised in 78%, which was lower than the 88% of completely excised BCCs of the trunk and 86% of the limbs (Table 1). The risk of an incomplete excision was higher for

BCCs of the head and neck than for BCCs of the trunk and limbs (adjusted OR 3, 95% CI 2–4) ( $p < 0.0001$ ) (Table 2). BCCs of the head and neck were completely excised by GPs in 56%, which was lower than the 89% for dermatologists and 80% for plastic surgeons (Table 1). For the complete excision of a BCC of the head and neck, dermatologists performed better than GPs and plastic surgeons ( $p < 0.001$ ). When BCCs of the head and neck were subdivided per histological subtype, GPs still showed the lowest proportion of complete excisions when compared to the dermatologists ( $p < 0.001$  for each subtype), while differences between dermatologists and plastic surgeons were not significant ( $p > 0.0125$ ).

#### *BCCs with an Infiltrative or Mixed Histological Subtype*

Infiltrative BCCs were completely excised in 66%, which was lower than the 86% of nodular, 90% of superficial, 78% of mixed nonaggressive, and 78% of mixed aggressive BCCs ( $p < 0.001$ ) (Table 1).

The risk of an incomplete excision was higher for BCCs with the following histological subtypes: infiltrative (adjusted OR 3, 95% CI 2–5), mixed nonaggressive (adjusted OR 3, 95% CI 2–4), and mixed aggressive (adjusted OR 2, 95% CI 2–3) ( $p < 0.0001$ ). Infiltrative BCCs were completely excised by GPs in 45%, which was lower than the 88% for dermatologists, and 69% for plastic surgeons. For the complete excision of an infiltrative BCC, dermatologists performed better than GPs and plastic surgeons ( $p < 0.0125$ ). For both mixed nonaggressive and mixed aggressive subtypes, GPs had the lowest proportions of completely excised BCCs when compared to dermatologists and plastic surgeons. For the complete excision of mixed nonaggressive and mixed aggressive subtypes, dermatologists performed better than GPs ( $p < 0.001$ ).

## Discussion

This retrospective cross-sectional study of 2,986 pathology records from a Dutch regional laboratory, showed that primary BCCs were more often completely excised by a dermatologist (93%) than by a GP (70%) or plastic surgeon (83%). Compared to the dermatologist, BCCs which were excised by a GP were 6 times higher at risk of an incomplete excision (adjusted OR 6, 95% CI 5–8) and 2 times higher at risk when excised by a plastic surgeon (adjusted OR 2, 95% CI 2–3) ( $p < 0.0001$ ).

Previous studies found similar proportions of complete BCC excisions; however, these studies lack a sample size calculation, subgroup analyses per tumor site and histological subtype, and logistic regressions [8–11]. Dermatologists probably excise BCC more often complete than GPs and plastic surgeons because dermatologists are specifically trained in BCC care during their 5 years of specialization, and dermatologists are more experienced in BCC care due to the high case load in their daily practice. This might result in better clinical skills among dermatologists in recognizing skin lesions as suspected for BCC, and in demarcating the tumor preoperatively. Both skills contribute to the success of a complete BCC excision.

The risk of an incomplete excision was found higher for BCCs of the head and neck than for BCCs of the trunk and limbs (adjusted OR 3, 95% CI 2–4) ( $p < 0.0001$ ), irrespective of the specialist who performed the excision. First, this could be explained because BCCs of the H zone are known to grow more aggressively. Second, physicians might narrow their excision margins for BCCs of the head and neck to preserve functional and cosmetic outcome.

The risk of an incomplete excision was found to be higher for BCCs with an infiltrative or mixed histological subtype than for nodular or superficial BCCs. Smeets et al. [12] showed that excisions with a clinical tumor-free margin of 3 mm for primary facial BCCs with an infiltrative histological subtype were more often incomplete (25%) than other subtypes (12%,  $p < 0.05$ ). These findings suggest that preoperative histological subtype determination might be useful to indicate when wider clinical tumor-free excision margins are needed. Although in 1 out of 6 BCCs the most aggressive growth pattern is missed by the preoperative biopsy (i.e., sampling error), a biopsy was shown to be more sensitive and more specific than the clinical diagnosis on the histological subtype [13, 14].

Remarkably, the risk of an incomplete excision was found higher for small BCCs (i.e.,  $\leq 2$  cm). The clinical demarcation of a small BCC might be more difficult due to scar formation after a preoperative biopsy.

Strengths of this study are: the comparative design, the large sample size and analysis per tumor site, and histological subtype. This study was limited to a retrospective design which implicated selection bias between the specialties. Therefore, risk of an incomplete BCC excision between the specialties was adjusted for BCC site, specimen size, histological subtype, patients' age, and sex. But due to missing data, BCC localization in the H zone and exact clinical tumor size could not be specified. Also, it was unknown whether the BCC diagnosis was confirmed histologically prior to the excision and which excision margins were used. The real proportion of completely excised BCCs was overestimated in all groups due to missing tumor on the histological margins by applying the breadloaf technique.

In conclusion, this study shows that primary BCCs were more often completely excised by dermatologists than by GPs and plastic surgeons. Among GPs, complete excisions were specifically low for BCCs of the head and neck and BCCs with an infiltrative subtype. Dermatologists probably perform better because of their extensive training and high experience in BCC care. Before a shift of BCC care from secondary to primary care, there is a strong need for an integrated care pathway, including adequate training for GPs.

## Key Message

Basal cell carcinomas are more often completely excised by dermatologists than by general practitioners or plastic surgeons.



## Statement of Ethics

The study was conducted and reported according to the STROBE guidelines for cross-sectional studies. The Medical Ethical Committee of the Erasmus MC Rotterdam approved the study protocol (reference No. NL52923.078.15).

## Disclosure Statement

The authors have no conflicts of interest to disclose.

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