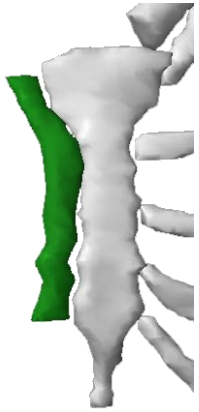
DBCG IMN2 study



DBCG repræsentantskabsmøde 22. januar 2026

PhD Anders W. Mølby Nielsen

Hovedvejleder Birgitte V. Offersen

Medvejledere: Lise B. J. Thorsen og Trine Tramm

DBCG IMN studies

Radiation-induced cardiac mortality in 10-year survivors → Left-sided patients

1990s

1997

Anthracyclines

2000

No evidence for the gain of IMNI

National DBCG guideline for all N+ patients

2003

Right side → IMNI

Left side → No IMNI

The New England Journal of Medicine

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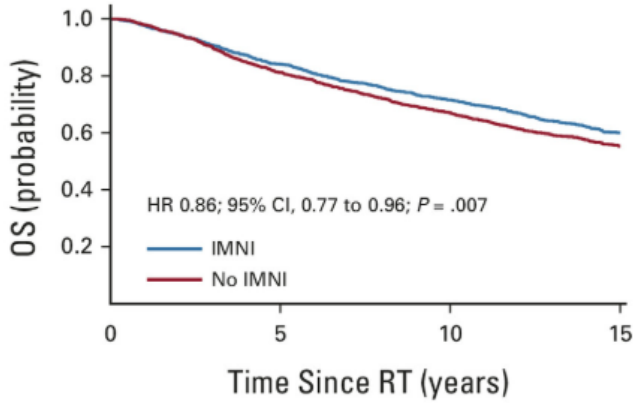
POSTOPERATIVE RADIOTHERAPY IN HIGH-RISK PREMENOPAUSAL WOMEN WITH BREAST CANCER WHO RECEIVE ADJUVANT CHEMOTHERAPY

MARIE OVERGAARD, M.D., PER S. HANSEN, M.D., JENS OVERGAARD, M.D., CARSTEN ROSE, M.D., MICHAEL ANDERSSON, M.D., FLEMMING BACH, M.D., MOGENS KJAER, M.D., CARL C. GADEBERG, M.D., HENNING T. MOURIDSEN, M.D., MAJ-BRITT JENSEN, M.SC., AND KARIN ZEDELER, M.SC., FOR THE DANISH BREAST CANCER COOPERATIVE GROUP 82b TRIAL

The DBCG 82bc trials document the effect of PMRT incl. regional node irradiation

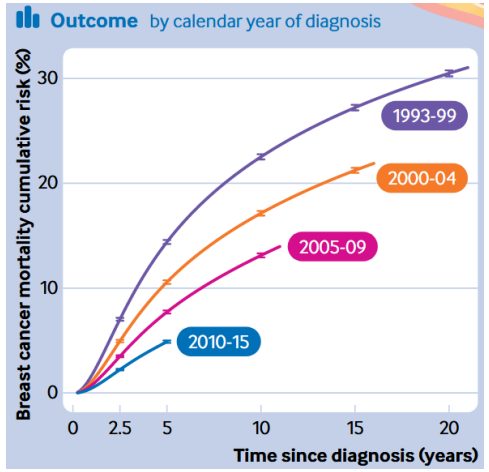
DBCG IMN2 background

The DBCG IMN1 study[1] and an EBCTCG meta-analysis[2] showed that internal mammary node irradiation (IMNI) improved distant metastasis, breast cancer mortality, and overall survival in node-positive breast cancer patients treated before 2007



Thorsen et al., JCO, 2015+22

Prognosis for breast cancer outcomes has improved markedly[3-4]



Taylor et al., BMJ, 2023

Nationwide screening, letrozol, taxanes, trastuzumab, and 3D-CRT were introduced after the DBCG IMN1 study[5]

Question: Is IMNI effective in node-positive breast cancer patients treated with newer systemic therapy and 3D-CRT?

[1]Thorsen et al., JCO, 2015+2022; [2]EBCTCG, Lancet; 2023; [3]EBCTCG, Lancet, 2024; [4]Taylor et al., BMJ, 2023; [5]Jensen et al. Acta Oncologica, 2018.

DBCG IMN2 cohort

Nationwide prospective population-based cohort study 2007-14

4541 node-positive BC patients treated with loco-regional radiotherapy were included from 6 centres

Patients with right-sided tumours received IMNI, left-sided did not

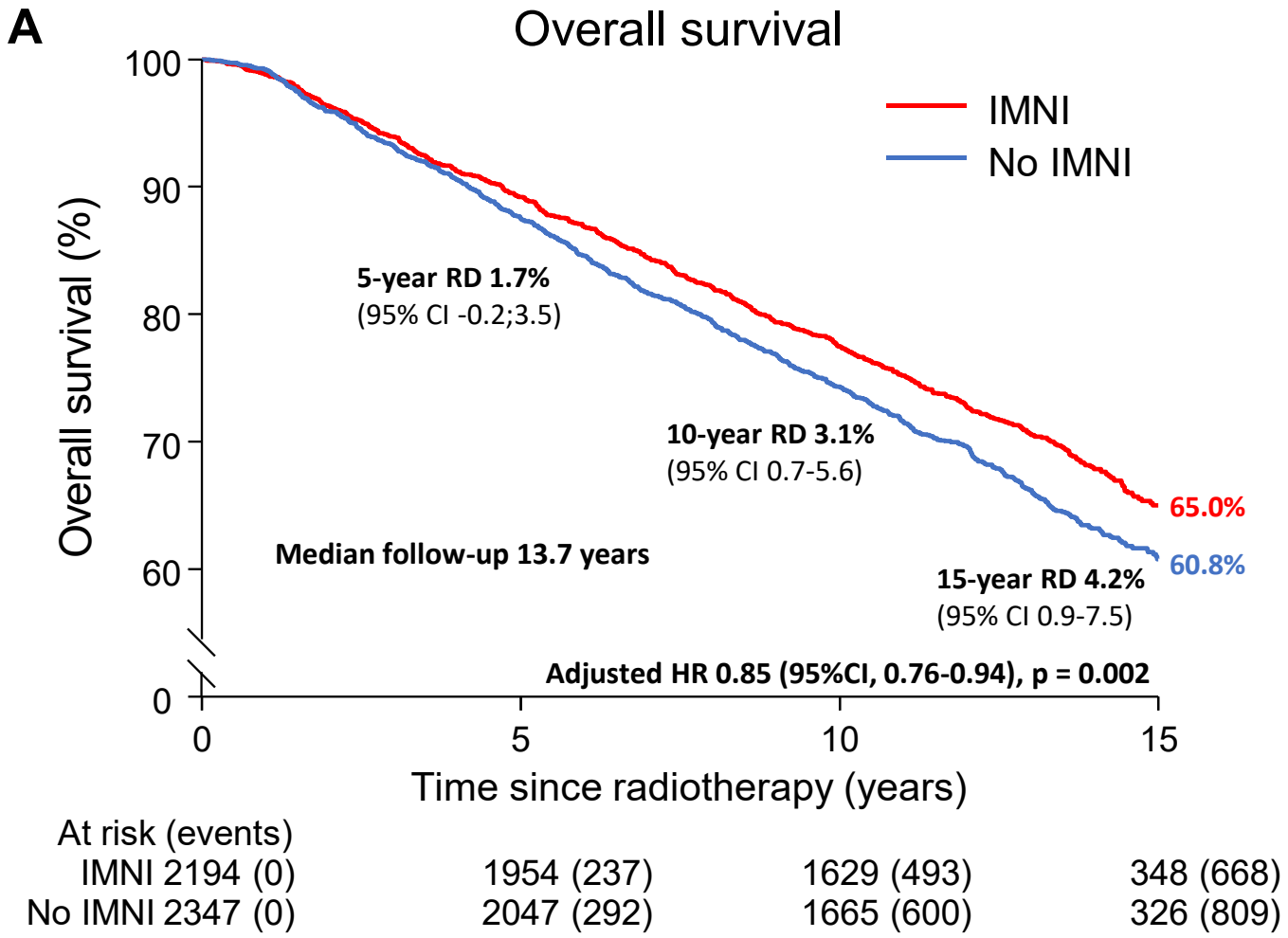
Baseline characteristics were evenly distributed between right- and left-sided patients

Table 1: Patient characteristics

	Laterality					
	Left n=2,347 (51.7%)		Right n=2,194 (48.3%)		Total n=4,541	
Age, median (IQR)	59	(50-66)	59	(50-66)	59	(50-66)
Menopausal status						
Premenopausal	681	(29.0%)	648	(29.5%)	1329	(29.3%)
Postmenopausal	1666	(71.0%)	1546	(70.5%)	3212	(70.7%)
Tumor size						
0-20 mm	1130	(48.1%)	1032	(47.0%)	2162	(47.6%)
21-50 mm	1119	(47.7%)	1074	(49.0%)	2193	(48.3%)
>50 mm	98	(4.2%)	88	(4.0%)	186	(4.1%)
Tumor location						
Medial or central	1011	(43.1%)	921	(42.0%)	1932	(42.5%)
Lateral	1335	(56.9%)	1273	(58.0%)	2608	(57.4%)
No primary tumor	1	(0.0%)	0	(0.0%)	1	(0.0%)
Type of surgery						
Mastectomy	1092	(46.5%)	1017	(46.4%)	2109	(46.4%)
Breast conserving surgery	1255	(53.5%)	1177	(53.6%)	2432	(53.6%)
LN removed, median (IQR)	16	(13-20)	17	(14-21)	17	(14-21)
Positive LN						
1-3	1610	(68.6%)	1490	(67.9%)	3100	(68.3%)
4-9	512	(21.8%)	469	(21.4%)	981	(21.6%)
≥ 10	225	(9.6%)	235	(10.7%)	460	(10.1%)
Histologic type						
IDC	2018	(86.0%)	1875	(85.5%)	3893	(85.7%)
ILC	232	(9.9%)	216	(9.8%)	448	(9.9%)
Other	97	(4.1%)	103	(4.7%)	200	(4.4%)
Grade of malignancy						
Grade 1	649	(27.7%)	618	(28.2%)	1267	(27.9%)
Grade 2	1010	(43.0%)	949	(43.3%)	1959	(43.1%)
Grade 3	680	(29.0%)	623	(28.4%)	1303	(28.7%)
Missing	8	(0.3%)	4	(0.2%)	12	(0.3%)
Estrogen receptor status						
Negative	371	(15.8%)	321	(14.6%)	692	(15.2%)
Positive	1976	(84.2%)	1873	(85.4%)	3849	(84.8%)
HER-2 status						
Negative	1893	(80.7%)	1793	(81.7%)	3686	(81.2%)
Positive	420	(17.9%)	374	(17.0%)	794	(17.5%)
Not evaluated	34	(1.4%)	27	(1.2%)	61	(1.3%)
Systemic Therapy						
Endocrine (ET)	893	(38.0%)	831	(37.9%)	1724	(38.0%)
Chemotherapy (CT)	345	(14.7%)	300	(13.7%)	645	(14.2%)
ET+CT	1077	(45.9%)	1026	(46.8%)	2103	(46.3%)
Trastuzumab	326	(13.9%)	288	(13.1%)	614	(13.5%)
None	32	(1.4%)	37	(1.7%)	69	(1.5%)

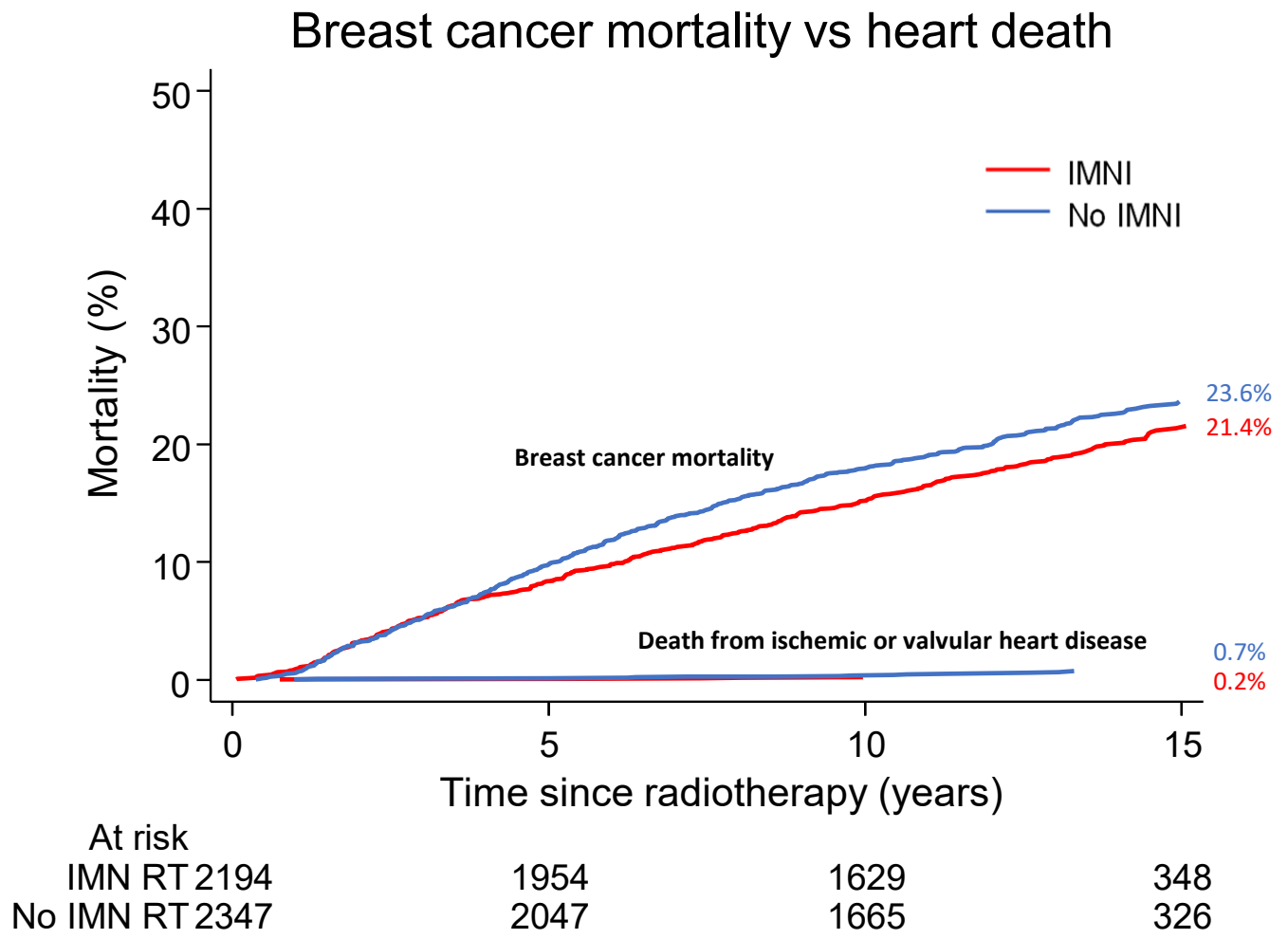
AWM Nielsen et al, Lancet Reg. Health Eur., 2025

DBCG IMN2 results



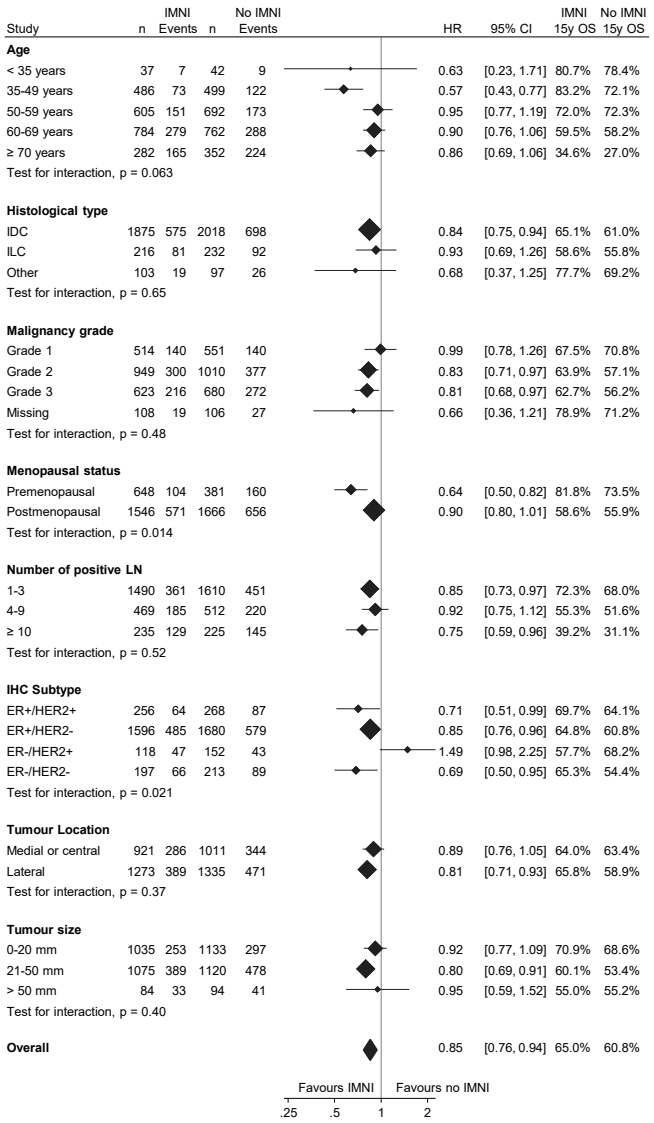
AWM Nielsen et al, Lancet Reg. Health Eur., 2025

DBCG IMN2 results

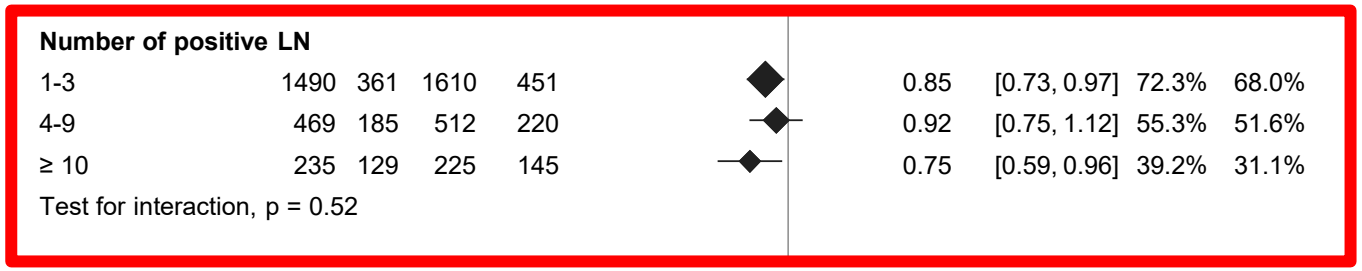


AWM Nielsen et al, Lancet Reg. Health Eur., 2025

DBCG IMN2 subgroups



Study	IMNI n	IMNI Events	No IMNI n	No IMNI Events	HR	95% CI	IMNI 15y OS	No IMNI 15y OS
Age								
< 35 years	37	7	42	9	0.63	[0.23, 1.71]	80.7%	78.4%
35-49 years	486	73	499	122	0.57	[0.43, 0.77]	83.2%	72.1%
50-59 years	605	151	692	173	0.95	[0.77, 1.19]	72.0%	72.3%
60-69 years	784	279	762	288	0.90	[0.76, 1.06]	59.5%	58.2%
≥ 70 years	282	165	352	224	0.86	[0.69, 1.06]	34.6%	27.0%
Test for interaction, p = 0.063								
Histological type								
IDC	1875	575	2018	698	0.84	[0.75, 0.94]	65.1%	61.0%
ILC	216	81	232	92	0.93	[0.69, 1.26]	58.6%	55.8%
Other	103	19	97	26	0.68	[0.37, 1.25]	77.7%	69.2%
Test for interaction, p = 0.65								
Malignancy grade								
Grade 1	514	140	551	140	0.99	[0.78, 1.26]	67.5%	70.8%
Grade 2	949	300	1010	377	0.83	[0.71, 0.97]	63.9%	57.1%
Grade 3	623	216	680	272	0.81	[0.68, 0.97]	62.7%	56.2%
Missing	108	19	106	27	0.66	[0.36, 1.21]	78.9%	71.2%
Test for interaction, p = 0.48								
Menopausal status								
Premenopausal	648	104	381	160	0.64	[0.50, 0.82]	81.8%	73.5%
Postmenopausal	1546	571	1666	656	0.90	[0.80, 1.01]	58.6%	55.9%
Test for interaction, p = 0.014								
Number of positive LN								
1-3	1490	361	1610	451	0.85	[0.73, 0.97]	72.3%	68.0%
4-9	469	185	512	220	0.92	[0.75, 1.12]	55.3%	51.6%
≥ 10	235	129	225	145	0.75	[0.59, 0.96]	39.2%	31.1%
Test for interaction, p = 0.52								
IHC Subtype								
ER+/HER2+	256	64	268	87	0.71	[0.51, 0.99]	69.7%	64.1%
ER+/HER2-	1596	485	1680	579	0.85	[0.76, 0.96]	64.8%	60.8%
ER-/HER2+	118	47	152	43	1.49	[0.98, 2.25]	57.7%	68.2%
ER-/HER2-	197	66	213	89	0.69	[0.50, 0.95]	65.3%	54.4%
Test for interaction, p = 0.021								
Tumour Location								
Medial or central	921	286	1011	344	0.89	[0.76, 1.05]	64.0%	63.4%
Lateral	1273	389	1335	471	0.81	[0.71, 0.93]	65.8%	58.9%
Test for interaction, p = 0.37								
Tumour size								
0-20 mm	1035	253	1133	297	0.92	[0.77, 1.09]	70.9%	68.6%
21-50 mm	1075	389	1120	478	0.80	[0.69, 0.91]	60.1%	53.4%
> 50 mm	84	33	94	41	0.95	[0.59, 1.52]	55.0%	55.2%
Test for interaction, p = 0.40								
Overall					0.85	[0.76, 0.94]	65.0%	60.8%



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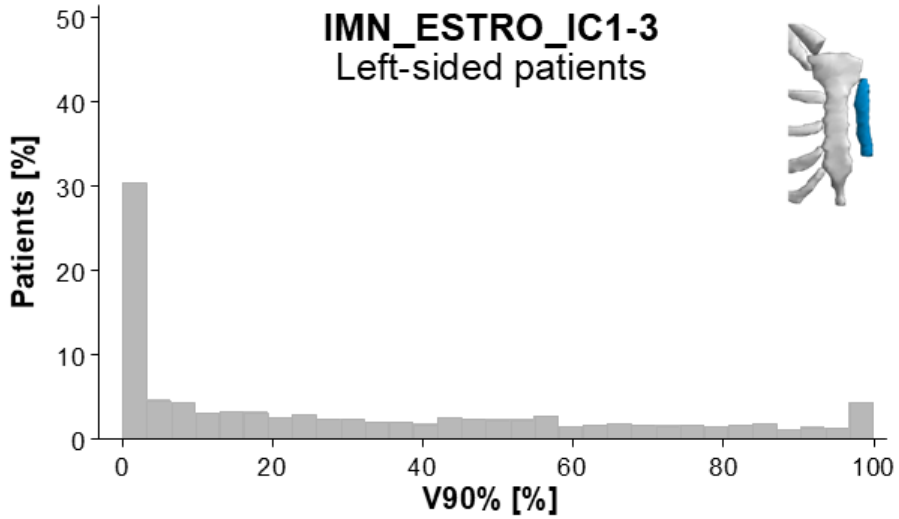
≥ 10	235	129	225	145	0.75	[0.59, 0.96]	39.2%	31.1%
Test for interaction, p = 0.52								

AWM Nielsen et al, Lancet Reg. Health Eur., 2025

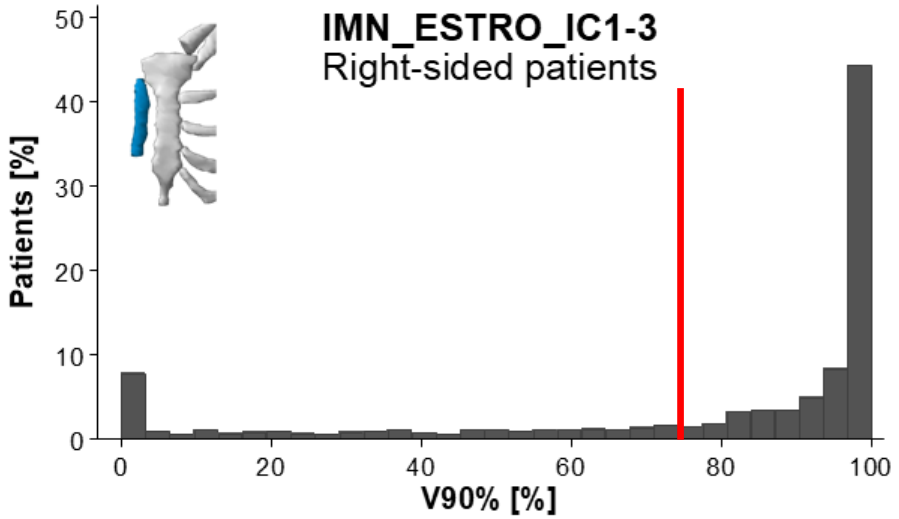
DBCG IMN2 radiotherapy quality assurance

Material: 2837 individual treatment plans collected in DBCG RT Nation

Method: DBCG developed auto-segmentation model



Median 20.4% (IQR 0.9-55.8)

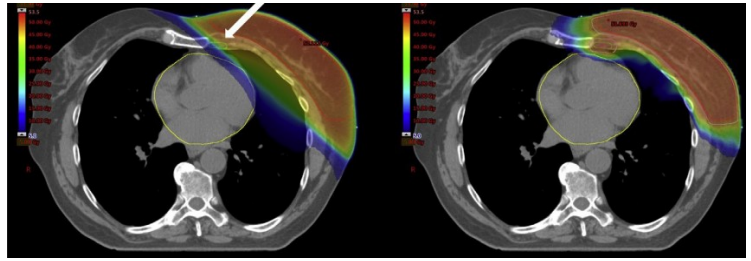


Median 94.6% (IQR **64.8**-100)

Refsgaard et al, Radiother Oncol, 2025

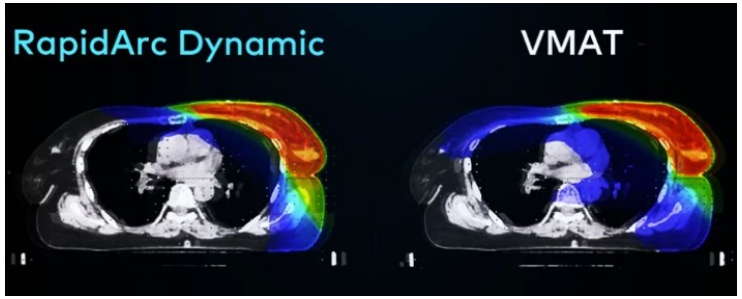
Future perspectives for IMNI

Newer techniques like respiratory gating, Proton, VMAT, hybrid radiotherapy techniques can improve target coverage and decrease dose to heart and lungs[1-3]



Stick et al., 2017

However, caution is warranted as highly conformal photon techniques are more vulnerable towards intrafractional movements[4]



Varian, 2025

Some node-negative patients may benefit from IMNI in this context

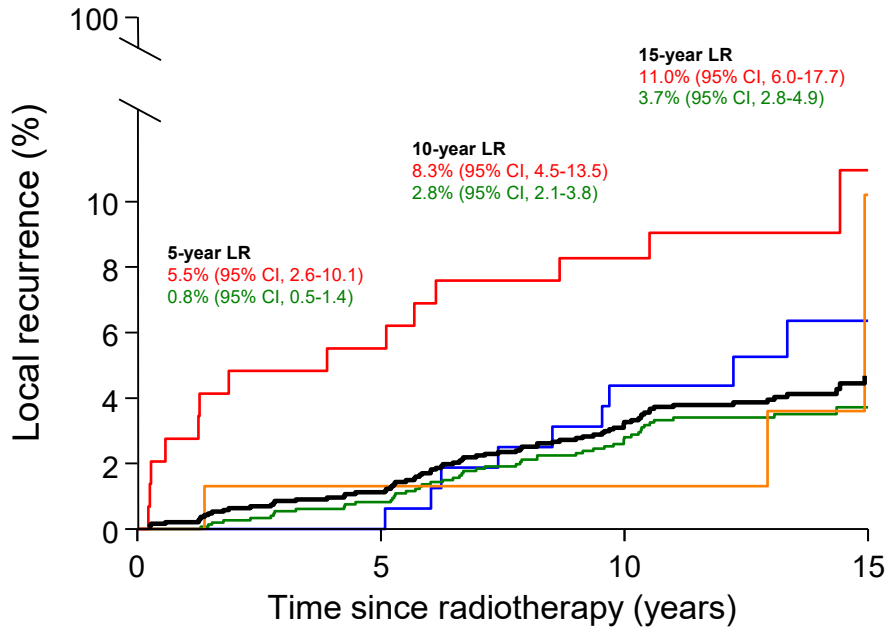
[1]*Vikstrøm et al, Acta Oncologica, 2011;* [2]*Stick et al., Int J Radiation Oncol Biol Phys, 2017;*
[3]*Ranger et al, Clinical Oncology, 2018;* [4]*AWM Nielsen et al, Phys. Imaging Radiat. Oncol., 2023*

Post-hoc analysis of tumour-bed boost

In the DBCG IMN2 cohort, local recurrence rates were investigated in 1872 patients treated with breast conserving surgery, whole breast irradiation but no tumour-bed boost

Patients ≥ 50 years with ER-/HER2- tumours had significantly higher recurrence rates than other subtypes

DBCG guidelines changed 1/3-2025 to recommend a tumour-bed boost to all patients with ER-/HER2- tumours



Number at risk

ER+/HER2-	1465	1269	941	164
ER+/HER2+	160	133	107	19
ER-/HER2+	76	59	48	8
ER-/HER2-	145	106	78	18
All patients	1872	1585	1188	209

AWM Nielsen et al, Radiother Oncol, 2025

Thanks to all the patients, DBCG, participating centres, and all collaborators

DBCG DANISH BREAST CANCER GROUP

Danish Cancer Society