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Vendors Used in CT and MRI Neuroradiology Research

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AJNR Am J Neuroradiol 2019, 40 (9) E48-E49

doi: <https://doi.org/10.3174/ajnr.A6180>

<http://www.ajnr.org/content/40/9/E48>

This information is current as
of April 18, 2024.

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The market for radiology equipment is competitive throughout the world because the gross sales overall may be in the tens of billions of dollars. The vendors of these machines often compete on the basis of price, relationships with purchasers, volume discounting, and convenience of use. However, the perception that one manufacturer has an advantage in advanced technology over the other may also impact sales decisions, particularly at cutting edge research institutions. Assessing the quality of a manufacturer's research and development (R&D) is a difficult process. Industry may show its dedication to advancement by sponsoring research projects with funds and/or providing access to "works-in-process" advanced techniques to interested parties. We sought to determine the relative contributions of manufacturers to the neuroradiology literature in 2018 for the *American Journal of Neuroradiology* (AJNR) and a European-based (*Neuroradiology*) journal. Although this search may not be a true test of the quality of the R&D effort of a company, it may indicate which vendor has an advantage in neuroradiology research publications and, by proxy, institutions.

Thus, we reviewed each original research article published in 2018 in the AJNR and *Neuroradiology* and recorded which vendor was specified in the methodology for CT and MR imaging articles. For each technique, the results were aggregated on the whole and into categories for brain, spine, and head and neck to determine the frequencies of vendors mentioned in the articles. For MR imaging (Tables 1 and 2) and CT (Tables 3 and 4) articles, we categorized manufacturers as Siemens (Erlangen, Germany), GE Healthcare (Milwaukee, Wisconsin), Philips Healthcare (Best, the Netherlands) and

"Others." As a retrospective bibliometric analysis that did not involve human subjects, this study was exempt from institutional review board approval and was Health Insurance Portability and Accountability Act compliant.

We found that Siemens (72/190, 37%) led the AJNR literature in MR imaging studies overall, including 36% of brain, 40% of spine, and 46% of head and neck publications. For CT, the gap narrowed with Siemens accounting for 38% of CT articles. GE Healthcare and Philips Healthcare competed for second place in AJNR. In *Neuroradiology*, similar trends were seen, except in head and neck. Siemens was favored in the *Neuroradiology* MR imaging literature, constituting 42% of brain and 75% of spine articles. For CT, Siemens was dominant with 73% of brain and 75% of spine neuroradiology articles. Taken in total, Siemens had more mentions than other vendors ($P < 0.01$).

Our study noted that research performed on Siemens CT and MR imaging products led overall in the American- and European-based journals we selected for 2018. That advantage was more noteworthy in MR imaging research and in *Neuroradiology*.

Disclosures: David Yousem—UNRELATED: Expert Testimony: medicolegal; Payment for Lectures Including Service on Speakers Bureaus: American College of Radiology; Royalties: Elsevier.

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<http://dx.doi.org/10.3174/ajnr.A6180>

Table 1: AJNR MR imaging articles published in 2018

Body Part	Siemens (No./No.) (%)	GE Healthcare (No./No.) (%)	Philips Healthcare (No./No.) (%)	Others (No./No.) (%)	Total
Brain	52/144 (36%)	52/144 (36%)	34/144 (23%)	6/144 (4%)	144
Spine	8/20 (40%)	5/20 (25%)	7/20 (35%)	0/20 (0%)	20
Head and neck	12/26 (46%)	4/26 (15%)	9/26 (34%)	1/26 (3%)	26
Totals	72/190 (37%)	61/190 (32%)	50/190 (26%)	7/190 (3%)	190

Table 2: Neuroradiology MR imaging articles published in 2018

Body Part	Siemens (No./No.) (%)	GE Healthcare (No./No.) (%)	Philips Healthcare (No./No.) (%)	Others (No./No.) (%)	Total
Brain	25/59 (42%)	17/59 (28%)	16/59 (27%)	1/59 (1.6%)	59
Spine	3/4 (75%)		1/4 (25%)		4
Head and neck	4/14 (28%)	4/14 (28%)	6/14 (42%)		14
Totals	32/77 (41%)	21/77 (27%)	23/77 (29%)	1/77 (1.2%)	77

Table 3: CT vendors noted in AJNR articles

Body Part	Siemens (No./No.) (%)	GE Healthcare (No./No.) (%)	Philips Healthcare (No./No.) (%)	Others (No./No.) (%)	Total
Brain	2/8 (25%)	3/8 (37%)	1/8 (12%)	2/8 (25%)	8
Spine	1/6 (16%)	3/6 (50%)	1/6 (16%)	1/6 (16%)	6
Head and neck	5/7 (71%)	2/7 (29%)			7
Totals	8/21 (38%)	8/21 (38%)	2/21 (9%)	3/21 (14%)	21

Table 4: CT vendors noted in Neuroradiology articles

Body Part	Siemens (No./No.) (%)	GE Healthcare (No./No.) (%)	Philips Healthcare (No./No.) (%)	Others (No./No.) (%)	Total
Brain	11/15 (73%)	2/15 (13%)	1/15 (6%)	1/15 (6%)	15
Spine	3/4 (75%)			1/4 (25%)	4
Head and neck	1/6 (16%)	3/6 (50%)		2/6 (33%)	6
Totals	15/25 (60%)	5/25 (8%)	1/25 (4%)	4/25 (16%)	25