

## Works Cited

### Primary Sources

Greatbatch, Wilson. *The Making of the Pacemaker: Celebrating a Lifesaving Invention*. Amherst, Prometheus Books, 2000. This book provided information on the technical side of the pacemaker, the history of the pacemaker, and the roadblocks that inventor Wilson Greatbatch ran into.

Hoiberg, Fred. Videoconference interview. Jan. 2020. In this interview, we talked to Fred Hoiberg, a former NBA player. He explained why he got a pacemaker and how it affected his life in both positive and negative ways.

Larson, Dr. Kathryn. Videoconference interview. Jan. 2020. We conducted this interview with a specialist to gather specific information on the makeup of the pacemaker and how it has changed over time.

Torres, Mauricio. Interview. Jan. 2020. We conducted this interview to gather specific information about an individual's experience with receiving a pacemaker.

### Secondary Sources

Abu Hasan, Hezne Ezaty. "The Man and His Accidental Invention: The Pacemaker." *MIMS Today*, 29 May 2017, [today.mims.com/the-man-and-his-accidental-invention/](http://today.mims.com/the-man-and-his-accidental-invention/). Accessed 25 Nov. 2019. This source provided us with information about how Wilson Greatbatch invented the first implantable pacemaker by accident. It gave a short description of his life and the challenges he faced as he attempted to develop a safe, long-term pacemaker.

Aquilina, Oscar. "A Brief History of Cardiac Pacing." *PMC*, National Center for Biotechnology Information, U.S. National Library of Medicine, 8 June 2006, [www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3232561/). Accessed 18 Dec. 2019. This site covered the history of heart discovery and research. It included many helpful and detailed pictures as well.

Bains, Perminder, et al. John Hopps and the Pacemaker: A History and Detailed Overview of Devices, Indications, and Complications. *BC Medical Journal*, Doctor of BC, Feb. 2017, [www.bcmj.org/articles/john-hopps-and-pacemaker-history-and-detailed-overview-devices-indications-and-complications](http://www.bcmj.org/articles/john-hopps-and-pacemaker-history-and-detailed-overview-devices-indications-and-complications). Accessed 20 Jan. 2020. This website provided information about John Hopps and how he developed the pacemaker. It discussed his early experiments and contributions to the field of medicine. It also discussed the risks and benefits of the pacemaker and how they are used today.

Baker, Kevin. *America the Ingenious*. Illustrated by Chris Dent, New York, New York, Artisan, a division of Workman Publishing, 2016. This book provided information on the history of both the internal and external pacemakers, as well as details regarding how a pacemaker is implanted.

*Biventricular Pacemaker*. *Radiopaedia*, [radiopaedia.org/cases/biventricular-pacemaker-2](http://radiopaedia.org/cases/biventricular-pacemaker-2). Accessed 2 Feb. 2020. This image depicted a biventricular pacemaker in situ with leads in the right atrium, right ventricle, and coronary sinus. We also included the image in the "Pacemakers Today" section on our website.

A boxlike external pacemaker. *Quora*, [www.quora.com/What-is-a-mistake-someone-made-that-entirely-changed-an-industry](http://www.quora.com/What-is-a-mistake-someone-made-that-entirely-changed-an-industry).

Accessed 2 Feb. 2020. This is a photo of a large, boxlike external pacemaker. We used this on the "External Pacemakers" page on our website.

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[www.animalresearch.info/en/medical-advances/timeline/cardiac-pacemakers/](http://www.animalresearch.info/en/medical-advances/timeline/cardiac-pacemakers/). Accessed 20 Jan. 2020. We used this source to get general information on the early history of pacemaker research and development. It also provided us with an image to use on our website.

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DeJauregui, Ruth. *100 Medical Milestones That Shaped World History*. Bluewood Books, 1998.

100 Series. This book provided a brief description of the history of the external pacemaker, developed by Paul M. Zoll, as well as the eventual development of internal pacemakers.

*Dual Chamber Pacemaker - Chest X-Ray. Johnson Francis,*

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2020. We included this image in the "Pacemakers Today" section on our website.

Fenster, Julie M. *Mavericks, Miracles, and Medicine*. Carroll and Graf Publishers, 2003. This

book told the story of Arne Larsson, the first human to receive an implantable pacemaker

and some of the initial concerns some people had regarding pacemakers.

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*Greatest Medical Breakthrough of Our Lives*. New York, St. Martin's Press, 2015. This

book covered the history of the pacemaker, how it was developed, and how it helped

people today with certain cardiac issues.

Hayes, David L., et al. *Understanding Your Pacemaker or Defibrillator*. Cardiotext Publishing,

2012. This book provided very detailed information and illustrations on the pacemaker

and covered the benefits and challenges of living with one.

"The Heartbeat of Invention: How Pacemaker Creator Wilson Greatbatch Saved Countless

Lives." *Intellectual Venture*, Intellectual Ventures Management, LLC, 2019,

[www.intellectualventures.com/buzz/insights/the-heartbeat-of-invention-how-pacemaker-](http://www.intellectualventures.com/buzz/insights/the-heartbeat-of-invention-how-pacemaker-creator-wilson-greatbatch-saved-co)

[creator-wilson-greatbatch-saved-co](http://www.intellectualventures.com/buzz/insights/the-heartbeat-of-invention-how-pacemaker-creator-wilson-greatbatch-saved-co). Accessed 18 Nov. 2019. This site covered how

Wilson Greatbatch created the pacemaker, as well as the later advancements in the

pacemaker.

"Heart Disease and Pacemakers." *WebMD*,

[www.webmd.com/heart-disease/pacemaker-implant#1](http://www.webmd.com/heart-disease/pacemaker-implant#1). Accessed 20 Jan. 2020. This

article described the diseases that pacemakers are used for, and how they treat them. This also described where the pacemaker is inserted during surgery.

The image shows an X-ray of a pacemaker in a patient's chest. *Rn.com*,

[lms.rn.com/getpdf.php/1971.pdf](https://lms.rn.com/getpdf.php/1971.pdf). Accessed 27 Jan. 2020. We used this image on the "Internal Pacemaker" page on our website to help illustrate what the internal pacemaker looks like and where it is located in the chest.

"Implantable Pacemaker Inventor Wilson Greatbatch Dies." *BBC News*, BBC, 30 Sept. 2011, [www.bbc.com/news/world-us-canada-15085056](http://www.bbc.com/news/world-us-canada-15085056). Accessed 19 Nov. 2019. This source covered the history of early types of implantable pacemakers and their inventors. It showed how long the first models of pacemakers lasted in patients, who invented them, and how Greatbatch developed a longer-lasting, efficient, functional implantable pacemaker.

"Internal Pacemaker." *University of Buffalo: Jacobs School of Medicine and Biomedical Sciences*, U of Buffalo, 2020, [medicine.buffalo.edu/research/research\\_highlights.host.html/content/shared/smb/research\\_highlights/pacemaker.detail.html](http://medicine.buffalo.edu/research/research_highlights.host.html/content/shared/smb/research_highlights/pacemaker.detail.html). Accessed 20 Jan. 2020. This website thoroughly explained how Wilson Greatbatch invented the internal pacemaker and the lithium power battery. It also had an image that we could use.

"The Invention of the Cardiac Pacemaker." *US Department of Veteran Affairs*, 9 May 2018, [www.research.va.gov/research\\_in\\_action/The-invention-of-the-cardiac-pacemaker.cfm](http://www.research.va.gov/research_in_action/The-invention-of-the-cardiac-pacemaker.cfm). Accessed 2 Dec. 2019. This website included information about how and why the first

pacemakers were studied and used. For example, they first tested it on a dog and the first person to get a pacemaker implanted was a 77-year-old man.

Jenkins, Dean. "A Not So Brief History of Electrocardiography." *EGC Library*, 11 May 2009, [ecglibrary.com/ecghist.html](http://ecglibrary.com/ecghist.html). Accessed 21 Dec. 2019. This source provided a detailed timeline of the important events leading to the invention of the first internal pacemaker.

John Hopps. *Library and Archives Canada Blog*, [thediscoverblog.com/2017/11/08/beating-hearts-john-alexander-hopps-and-the-pacemaker/](http://thediscoverblog.com/2017/11/08/beating-hearts-john-alexander-hopps-and-the-pacemaker/). Accessed 2 Feb. 2020. This image showed John Hopps and we used it on the "Pacemaker Pioneers" page on our website.

John Hopps testing the world's first external pacemaker. *CBC*, [www.cbc.ca/2017/meet-the-canadian-engineer-who-casually-invented-the-pacemaker-1.4000971](http://www.cbc.ca/2017/meet-the-canadian-engineer-who-casually-invented-the-pacemaker-1.4000971). Accessed 2 Feb. 2020. This image depicted John Hopps testing the world's first external pacemaker and we used it on the "External Pacemakers" page on our website.

*Micra pacemaker next to a traditional pacemaker. Medgadget*, [www.medgadget.com/2016/04/medtronics-tiny-micra-leadless-pacemaker-approved-in-us.html](http://www.medgadget.com/2016/04/medtronics-tiny-micra-leadless-pacemaker-approved-in-us.html). Accessed 2 Feb. 2020. This image showed a modern pacemaker next to a new, tiny, leadless pacemaker. We used this on the "History" page on the website.

Morelli, Gianni, editor. *Great Discoveries and Inventions That Have Changed the World*. Translated by Jonathan West et al., Milan, Italy, White Star s.r.l., 2018. This book provided information about the creator of the internal pacemaker, Wilson Greatbatch, and his research.

Osswald, Bridget, and B. Jakub Wilhelm, editors. "A Look Back: 85 Years of Cardiac Pacing."

*EP Lab Digest*, HMP Global, Sept. 2014,

[www.eplabdigest.com/articles/Look-Back-85-Years-Cardiac-Pacing](http://www.eplabdigest.com/articles/Look-Back-85-Years-Cardiac-Pacing). Accessed 20 Jan.

2020. This article summarized the history of the pacemaker from the 1920s to

modern-day. It focused on the timeline of changes and statistics about the number of

pacemakers implanted and lives saved.

*Pacemaker*. Heart Rhythm Society, [www.hrsonline.org/patient-resources/pacemaker](http://www.hrsonline.org/patient-resources/pacemaker). Accessed

20 Jan. 2020. This website discussed how a typical heart works and how it keeps a

steady, rhythmic heartbeat. It focused on what a present-day pacemaker is and gave

information on the five different types of pacemakers. It also discussed the types of

cardiac conditions that a pacemaker is used to correct.

"Pacemaker." *Brought to Life Exploring the History of Medicine*, Science Museum,

[broughttolife.sciencemuseum.org.uk/broughttolife/techniques/pacemaker](http://broughttolife.sciencemuseum.org.uk/broughttolife/techniques/pacemaker). Accessed 20

Jan. 2020. This website provided information on the early development of external

pacemakers as well as the battery that allows internal pacemakers to be installed.

"Pacemaker." *Encyclopedia.com*, Encyclopedia, 12 Nov. 2019,

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[akers](http://www.encyclopedia.com/medicine/divisions-diagnostics-and-procedures/medicine/pacemakers). Accessed 19 Nov. 2019. This source explained the function of the pacemaker and

how the device and heart work together. The site also covered how the technology used

to create the pacemaker has been developed over time.

"Pacemaker." *Mayo Clinic*, Mayo Foundation for Medical Education and Research, 25 June

2019, [www.mayoclinic.org/tests-procedures/pacemaker/about/pac-20384689](http://www.mayoclinic.org/tests-procedures/pacemaker/about/pac-20384689). Accessed

20 Jan. 2020. This source provided information about three different types of pacemakers, their functions, and how they interact with the heart. In addition, it provided information about the risks of a pacemaker implantation procedure and the precautions you should consider before, during, and after the procedure.

*Pacemaker*. 25 July 2018. *Medline Plus*, [medlineplus.gov/ency/imagepages/19566.htm](https://medlineplus.gov/ency/imagepages/19566.htm).

Accessed 2 Feb. 2020. This image was displayed on our website under the "Pacemakers Today" section.

"Pacemaker Documentation." *Cluster Labs*, 0.22 ed.,

[www.clusterlabs.org/pacemaker/doc/index.php](http://www.clusterlabs.org/pacemaker/doc/index.php). Accessed 20 Dec. 2019. This website contained many PDFs that thoroughly explain the pacemaker and its configuration.

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[nationalmaglab.org/education/magnet-academy/history-of-electricity-magnetism/museum/pacemaker](http://nationalmaglab.org/education/magnet-academy/history-of-electricity-magnetism/museum/pacemaker). Accessed 19 Jan. 2020. This website provided information about the early experiments with primitive external devices and how they evolved to the internal pacemakers of today. It focused on the problems of the early models and how each new model tried to address these issues.

"Pacemakers." *National Heart, Lung, and Blood Institute*, NIH,

[www.nhlbi.nih.gov/health-topics/pacemakers](http://www.nhlbi.nih.gov/health-topics/pacemakers). Accessed 20 Dec. 2019. This article provided information on what pacemakers do, how they work, and what to expect during the surgery to implant a pacemaker.

"Pacemakers." *Texas Heart Institute*,

[www.texasheart.org/heart-health/heart-information-center/topics/pacemakers/](http://www.texasheart.org/heart-health/heart-information-center/topics/pacemakers/). Accessed

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"Pacemaker Surgery." *WebMD*, 2020, [www.webmd.com/heart-disease/video/pacemaker-surgery](http://www.webmd.com/heart-disease/video/pacemaker-surgery).

Accessed 20 Jan. 2020. This website provided a video that showed the anatomy of the heart and how it works. It also showed an example of the surgery of implanting a pacemaker and how the pacemaker corrects the issues of the heart.

*The Return of the "Garage Gang." Twin Cities,*

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This image showed a doctor putting an external pacemaker on a small boy. We used this on the "External Pacemakers" page on the website.

Rippe, James M. *Preventing and Reversing Heart Disease for Dummies*. Hoboken, New Jersey, John Wiley and Sons, 2015. This book included basic information on heart disease and the benefits and challenges of the various treatments.

Shapiro, T. Rees. "Wilson Greatbatch, Engineer Who Invented Implantable Pacemaker, Dies at 92." *The Washington Post*, 28 Sept. 2011,

[www.washingtonpost.com/local/obituaries/wilson-greatbatch-engineer-who-invented-implantable-pacemaker-dies-at-92/2011/09/28/gIQAKEtp5K\\_story.html?noredirect=on](http://www.washingtonpost.com/local/obituaries/wilson-greatbatch-engineer-who-invented-implantable-pacemaker-dies-at-92/2011/09/28/gIQAKEtp5K_story.html?noredirect=on).

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"A Short History on Pacemakers." *Science Direct*, Elsevier B.V., 2013,

[www.sciencedirect.com/science/article/abs/pii/S0167527313016768](http://www.sciencedirect.com/science/article/abs/pii/S0167527313016768). Accessed 16 Jan.

2020. This article discussed 300 years of contributions to science that led to the

modern-day pacemaker. Information about electrotherapy and electrophysiology, which are the basis for the development of the pacemaker was discussed.

Shows a futuristic pacemaker. *UA News*,

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Feb. 2020. This image showed a futuristic pacemaker that doesn't use batteries. We used this on the "History" page on our website.

*Shows a man with a large external pacemaker attached to him. Quora*,

[www.quora.com/What-is-a-mistake-someone-made-that-entirely-changed-an-industry](http://www.quora.com/What-is-a-mistake-someone-made-that-entirely-changed-an-industry).

Accessed 2 Feb. 2020. This photograph showed a man with a very large box-like external pacemaker and we used this on the "History" page on the website.

Shows an external pacemaker around a patient's neck. *DBS Pacemakers*,

[dbspacemaker.weebly.com/history.html](http://dbspacemaker.weebly.com/history.html). Accessed 1 Feb. 2020. This image showed an

external pacemaker around a patient's neck, and we used it on the "External Pacemakers" section on our website.

Shows the evolution of the internal pacemaker. *Access Medicine*,

[accessmedicine.mhmedical.com/Content.aspx?bookId=2046&sectionId=176564682](http://accessmedicine.mhmedical.com/Content.aspx?bookId=2046&sectionId=176564682).

Accessed 2 Feb. 2020. This image showed the evolution of the pacemaker and we used it on the "History" page on our website.

*Siemens-Elema 1958. Wikimedia Commons*,

[commons.wikimedia.org/wiki/File:First\\_pacemaker\\_\(Siemens-Elema\\_1958\).jpg](http://commons.wikimedia.org/wiki/File:First_pacemaker_(Siemens-Elema_1958).jpg).

Accessed 2 Feb. 2020. This photograph showed an old pacemaker from 1958. We used this on the "History" page on the website.

Sparks, Karen. "Wilson Greatbatch." *Encyclopædia Britannica*, 23 Sept. 2019, [www.britannica.com/biography/Wilson-Greatbatch](http://www.britannica.com/biography/Wilson-Greatbatch). Accessed 20 Jan. 2020. This source gave a brief biography on Wilson Greatbatch and his process of inventing the pacemaker.

*Surgeon holds a dual-chamber internal cardiac pacemaker. Very Well Health*, [www.verywellhealth.com/pacemakers-what-you-should-know-1745231](http://www.verywellhealth.com/pacemakers-what-you-should-know-1745231). Accessed 2 Feb. 2020. This image showed a surgeon holding a pacemaker. We used this image on the "Thesis" page on our website.

This photo shows Otis Boykin. *Scholastic*, [teacher.scholastic.com/activities/bhistory/inventors/boykin.htm](http://teacher.scholastic.com/activities/bhistory/inventors/boykin.htm). Accessed 1 Feb. 2020. This photo showed Otis Boykin. We used it on the "Pacemaker Pioneers" section on our website.

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"What Is an External Pacemaker." *WiseGeek*, Conjecture, 2020, [www.wisegeek.com/what-is-an-external-pacemaker.htm#didyouknowout](http://www.wisegeek.com/what-is-an-external-pacemaker.htm#didyouknowout). Accessed 19 Jan. 2020. This website provided us with information on how the pacemaker works. It focused on how the pacemaker corrects irregular heartbeats using electrical stimulation.

"Who Invented the Pacemaker." *Who Invented It*, 2020, [www.whoinventedit.net/who-invented-the-pacemaker.html](http://www.whoinventedit.net/who-invented-the-pacemaker.html). Accessed 20 Jan. 2020. This

website gave information about John Hopps, who was credited with the development of the first external pacemaker, and about the lithium battery.

*William M. Chardack, MD. Heart Rythm,*

[www.heartrhythmjournal.com/article/S1547-5271\(06\)01714-0/pdf](http://www.heartrhythmjournal.com/article/S1547-5271(06)01714-0/pdf). Accessed 1 Feb.

2020. This image was of William M. Chardack, who assisted Wilson Greatbatch in inventing the first internal pacemaker. We used it on our website.

Wilson Greatbatch holding an internal pacemaker. *Steemit,*

[steemit.com/exyle/@exyle/thank-you-wilson-greatbatch-inventor-of-implantable-pacemaker](https://steemit.com/exyle/@exyle/thank-you-wilson-greatbatch-inventor-of-implantable-pacemaker). Accessed 1 Feb. 2020. This image showed Wilson Greatbatch holding two internal pacemakers and we used this picture on the "Home" page on the website.

Wilson Greatbatch holding a pacemaker. *Word Press,* [etreliaqua.wordpress.com/page/3/](http://etreliaqua.wordpress.com/page/3/).

Accessed 2 Feb. 2020. This image showed Wilson Greatbatch holding a pacemaker and we used this on the "Pacemaker Pioneers" page on our website.

"Wilson Greatbatch: Inventor of the Implantable Cardiac Pacemaker." *Independent*, edited by Marcus Williamson, 30 Sept. 2011,

[www.independent.co.uk/news/obituaries/wilson-greatbatch-inventor-of-the-implantable-cardiac-pacemaker-2363206.html](http://www.independent.co.uk/news/obituaries/wilson-greatbatch-inventor-of-the-implantable-cardiac-pacemaker-2363206.html). Accessed 16 Jan. 2020. This site contained information on Wilson Greatbatch, and how his work led the invention of the pacemaker.

Wish, Mark, Dr. "History and Development of Pacemakers." *Inova Heart and Vascular*, Inova, 2019, [www.inovaheart.org/heart-care/pacemaker/history](http://www.inovaheart.org/heart-care/pacemaker/history). Accessed 2 Dec. 2019. This site followed the evolution of pacemaker and how it has developed over time. It covered the

challenges that Wilson Greatbatch had to overcome in the development of an efficient and successful pacemaker.

*An X-ray of a pacemaker inside of a patient's chest. Intechopen.com,*

[www.intechopen.com/books/cardiac-pacemakers-biological-aspects-clinical-applications-and-possible-complications/early-complications-after-pacemaker-implantations](http://www.intechopen.com/books/cardiac-pacemakers-biological-aspects-clinical-applications-and-possible-complications/early-complications-after-pacemaker-implantations).

Accessed 1 Feb. 2020. This image showed an X-ray image of a pacemaker in a patient's chest, and we used it on the "Home" page of the website.