

# COCHLEAR™ NUCLEUS® RELIABILITY REPORT

Volume 13 | February 2015

*Hear now. And always*



Cochlear®



**Holly Taylor**

Cochlear recipient since 1987

# OUR MISSION

We help people hear and be heard.

We **empower** people to connect with others and live a full life.

We **transform** the way people understand and treat hearing loss.

We **innovate** and bring to market a range of implantable hearing solutions that deliver a lifetime of hearing outcomes.

Cochlear's implants are the most reliable in the industry. That's one reason why more people choose Cochlear than any other implant brand.



COCHLEAR'S IMPLANTS  
ARE THE MOST **RELIABLE**  
IN THE INDUSTRY

# WHY RELIABILITY MATTERS

High implant reliability means greater patient satisfaction and less risk of additional surgery. When considering which implant is right for your patient, it's important that you have access to the latest data on short- and long-term reliability, success and failure rates and key implant features. These are outlined in this Reliability Report.

## ABOUT RELIABILITY REPORTING

The global standards for cochlear implant reliability reporting are the ***International Standard ISO 5841-2:2000***<sup>1</sup>, the reporting principles outlined in the ***European Consensus Statement on Cochlear Implant Failures and Explantations***<sup>2</sup>, and expert recommendations from the ***International Classification of Reliability for Implanted Cochlear Implant Receiver Stimulators***.<sup>3</sup>

Cochlear is the only hearing implant company that fully complies with these standards.

# Cochlear

100% compliant with  
international reporting standards



# HOW TO READ THIS REPORT

## What is Cumulative Survival Percentage (CSP)?

The cumulative percentage of functioning implants over time, which can be used to predict the reliability of the device within a given time period.

The reliability calculations used in this report are in accordance with the ISO 5841-2:2000 Standard.<sup>1</sup> They are probability calculations, which use a modified Kaplan-Meier estimator. These data estimate the probability of survival within a period of time and are represented as Cumulative Survival Percentage (CSP).

## What data is in this report?

The data in this report cover the entire life of implant models and registered implants\* worldwide.

MORE PEOPLE CHOOSE COCHLEAR THAN ANY OTHER IMPLANT BRAND

OVER 250,000 REGISTERED COCHLEAR NUCLEUS IMPLANTS WORLDWIDE

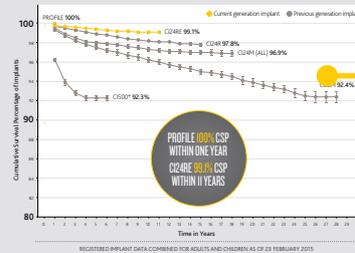
Number of registered implants - 23 February 2015

DEVICE	ADULTS	CHILDREN	COMBINED
Profile	896	541	1,437
CI40E	63,658	24,271	103,929
CI500	15,382	14,572	29,954
CI24R	18,828	34,354	53,182
CI24M (AI)	7,888	11,788	19,676
CI22M	9,971	8,212	18,183

Cumulative Survival Percentage (CSP) data for combined adults and children

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
CI40E	99.3	98.7	98.2	97.8	97.4	97.0	96.7	96.3	96.0	95.7	95.4	95.1	94.8	94.5	94.2	93.9	93.6	93.3	93.0	92.7	92.4	92.1	91.8	91.5	91.2	90.9	90.6	90.3	90.0	
CI500	99.5	99.0	98.5	98.0	97.5	97.0	96.5	96.0	95.5	95.0	94.5	94.0	93.5	93.0	92.5	92.0	91.5	91.0	90.5	90.0	89.5	89.0	88.5	88.0	87.5	87.0	86.5	86.0	85.5	85.0
CI24R	99.2	98.5	97.8	97.1	96.4	95.7	95.0	94.3	93.6	92.9	92.2	91.5	90.8	90.1	89.4	88.7	88.0	87.3	86.6	85.9	85.2	84.5	83.8	83.1	82.4	81.7	81.0	80.3	79.6	78.9
CI24M (AI)	99.1	98.4	97.7	97.0	96.3	95.6	94.9	94.2	93.5	92.8	92.1	91.4	90.7	90.0	89.3	88.6	87.9	87.2	86.5	85.8	85.1	84.4	83.7	83.0	82.3	81.6	80.9	80.2	79.5	78.8
CI22M	99.0	98.3	97.6	96.9	96.2	95.5	94.8	94.1	93.4	92.7	92.0	91.3	90.6	89.9	89.2	88.5	87.8	87.1	86.4	85.7	85.0	84.3	83.6	82.9	82.2	81.5	80.8	80.1	79.4	78.7

Nucleus Implant Reliability



## What is combined data?

The cumulative survival percentage of both adults and children population combined.

## How are results shown?

Results for adults and children are shown separately with 95% confidence intervals (±) as required by the Consensus Statement.

\*An implant is registered with Cochlear when clinic/hospital submits the registration of the implanted device. Implant registration often lag surgery dates.

# FULL COMPLIANCE WITH INTERNATIONAL REPORTING STANDARDS

In 2005, the major European cochlear implant centres, global regulatory authorities and device manufacturers developed the *European and Global Consensus Statement on Cochlear Implant Failures and Explantations*.<sup>2</sup> The Consensus Statement outlines how device failures and reliability should be reported, and the seven principles of best practice reporting.

Cochlear is the only hearing implant company that fully complies with the international reporting standards.

## CONSENSUS STATEMENT PRINCIPLE

All device failures must be reported to the competent authority and must be included in the calculation of the Cumulative Survival Rate (CSR\*). Reporting of the CSR should be in accordance with ISO Standard 5841-2:2000.<sup>1</sup>

Manufacturer's reports of device failure should indicate the sources of data and the sample size. There must be no exclusions. The time period over which the data was collected should be specified.

Reports of CSR should give complete historical data of a given device, describing any technical modifications (which can be integrated into historical data by starting at time 0).

The complete data set of the 'mother' product should always be supplied when presenting data on subsequent device modifications.

A new device can be attributed when there has been a change in either the case and/or the electrodes and/or the electronics and has been labelled by its own CE mark.

Cumulative Survival Rate should be split into data for adults and for children and 95% confidence intervals (80% or 90% if the population is below 1,000 units) should be provided.

Device survival time starts to count with closure of the wound intraoperatively.

COCHLEAR REPORTING PRACTICE	COCHLEAR COMPLIANCE	ADVANCED BIONICS COMPLIANCE <sup>4</sup>	MED-EL COMPLIANCE <sup>5</sup>
<p>All device failures are reported to the competent authority.</p> <p>Cochlear uses the applicable definitions, categorisation scheme and calculation procedures of ISO 5841-2:2000.<sup>1</sup></p> <p>All device failure modes are included, including failures due to external impact.</p>	✓	✓	✓
<p>The source of data is Cochlear's global complaints handling database.</p> <p>Sample size and time period are specified with each report.</p>	✓	✗ Sample size not included.	✗ Sample size not included.
<p>All models and all versions of each model are included in reports.</p> <p>Descriptions of any significant technical modifications are given.</p>	✓	✓	✗ COMBI 40+ no longer reported. PULSAR no longer reported.
<p>Reports aggregate the reliability of all devices (pre- and post- modification). If the post-modification is significantly different, post-modification is reported separately from the aggregate of all devices.</p>	✓	✓	✗ COMBI 40+ no longer reported. PULSAR no longer reported.
<p>A new device is attributed when there has been a change in either the case and/or the electrodes and/or the electronics and has been labelled by its own CE mark. Market practice is that all cochlear implants are labeled by one CE mark per authority.</p>	✓	? Not explicitly stated.	? Not explicitly stated.
<p>Reports show separate data for adults and children.</p> <p>This Nucleus Reliability Report contains reliability data with 95% confidence intervals, in compliance with the consensus statement.<sup>2,3</sup></p>	✓	✗ No split data on adults and children. Confidence intervals not included.	✗ No split data on adults and children. Confidence intervals not included.
<p>All failures are counted that occur any time after wound closure.</p>	✓	? Not explicitly stated.	? Not explicitly stated.

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NUCLEUS® IMPLANTS  
WORLDWIDE

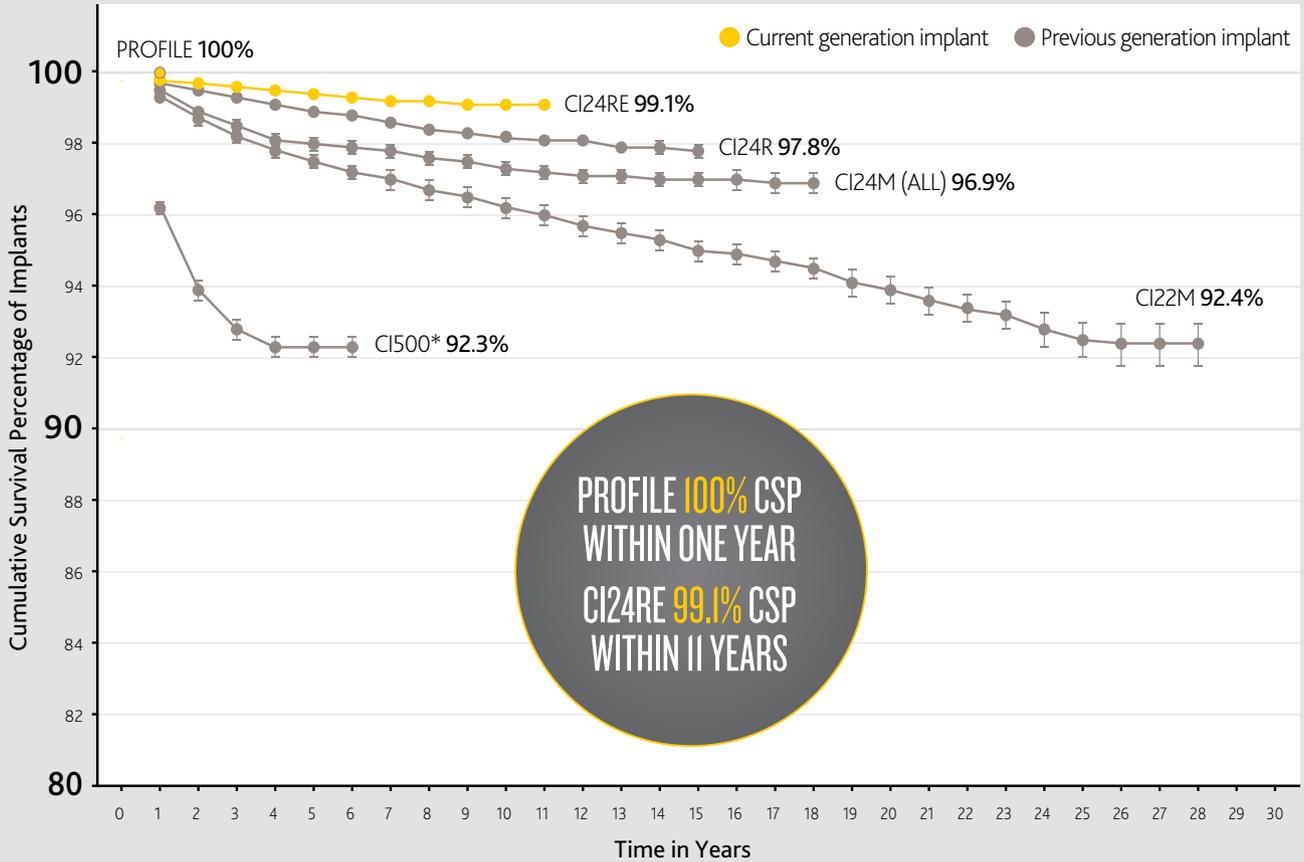
## Number of registered implants - 23 February 2015

DEVICE	ADULTS	CHILDREN	COMBINED
Profile	890	941	1,831
CI24RE	63,608	74,271	137,879
CI500	15,382	14,372	29,754
CI24R	18,828	34,354	53,182
CI24M (All)	7,888	11,788	19,676
CI22M	9,971	8,212	18,183

## Cumulative Survival Percentage (CSP) data for combined adults and children

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
CI22M	99.3	98.7	98.2	97.8	97.5	97.2	97.0	96.7	96.5	96.2	96.0	95.7	95.5	95.3	95.0	94.9	94.7	94.5	94.1	93.9	93.6	93.4	93.2	92.8	92.5	92.4	92.4	92.4	
CI24M (All)	99.5	98.9	98.5	98.2	98.0	97.9	97.8	97.6	97.5	97.3	97.2	97.1	97.1	97.0	97.0	97.0	96.9	96.9											
CI24R	99.7	99.5	99.3	99.1	98.9	98.8	98.6	98.4	98.3	98.2	98.1	98.1	97.9	97.9	97.8														
CI24RE	99.8	99.7	99.6	99.5	99.4	99.3	99.2	99.2	99.1	99.1	99.1																		
CI500	96.2	93.9	92.8	92.3	92.3																								
Profile	100																												

## Nucleus Implant Reliability



REGISTERED IMPLANT DATA COMBINED FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015

\* Voluntarily recalled in September 2011.



Leah Allion

Cochlear recipient since 2007

# CURRENT GENERATION IMPLANT DATA

# NUCLEUS PROFILE SERIES IMPLANT



## Number of registered Profile Series implants - 23 February 2015

ADULTS	CHILDREN	COMBINED
890	941	1,831

At only 3.9 mm, the thin implant body of the Profile Series is the most discreet choice for all patients. The implant also offers ease of use and faster surgery due to minimal drilling.

Commercially released in 2014, the Profile Series sets a new standard in implant reliability with a 100% combined Cumulative Survival Percentage within one year.

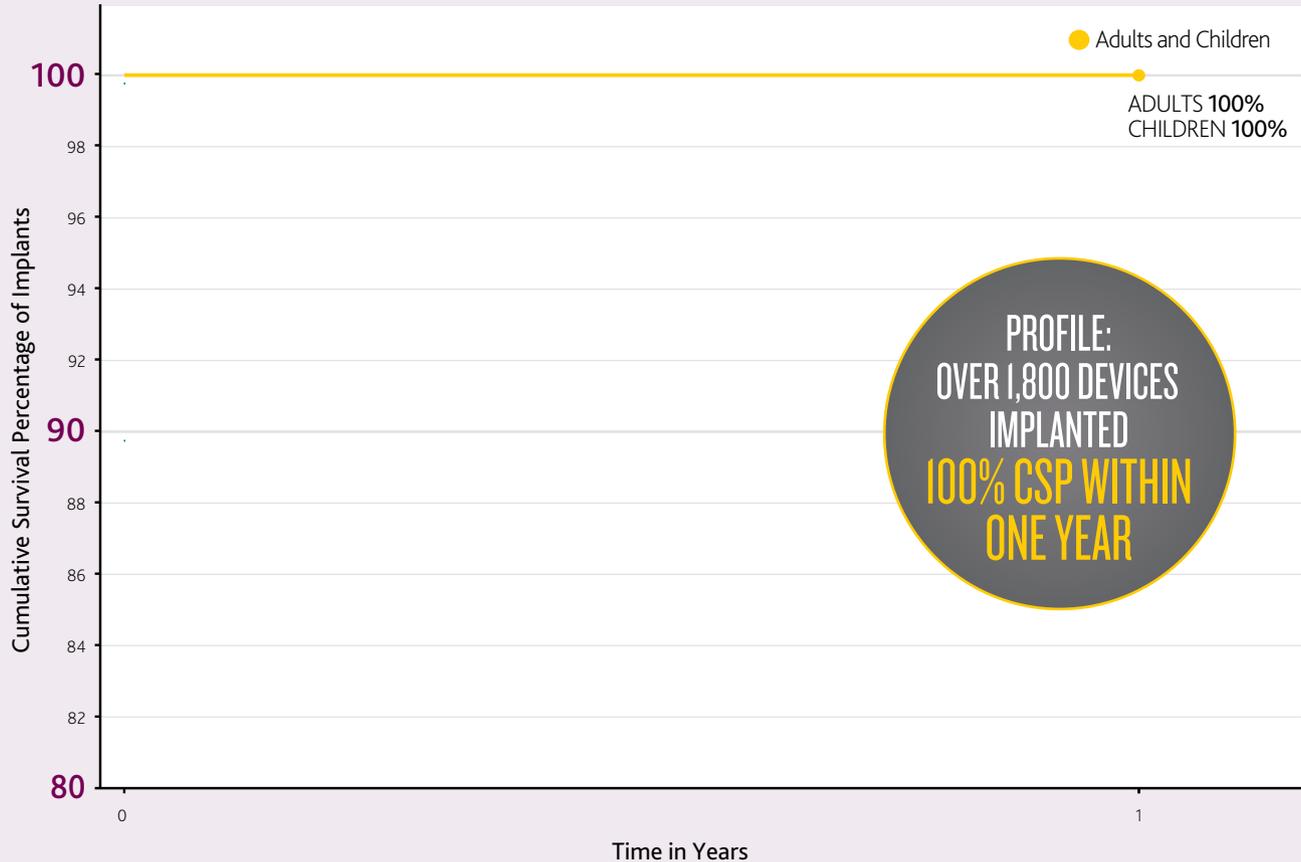
## Profile Series Cumulative Survival Percentage\*

YEAR	1
Adults	100
Children	100
Combined	100



\* One device has been explanted since the date of this report. The reason for the explant is yet to be determined. If the device is a failure it will be reported in the next Reliability Report.

## Profile Series Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015  
(No confidence interval presented in this chart due to 100% Cumulative Survival Percentage)

# NUCLEUS CI24RE SERIES IMPLANT



## Number of registered CI24RE Series implants - 23 February 2015

ADULTS	CHILDREN	COMBINED
63,608	74,271	137,879

The CI24RE Series is the world's most widely used cochlear implant.

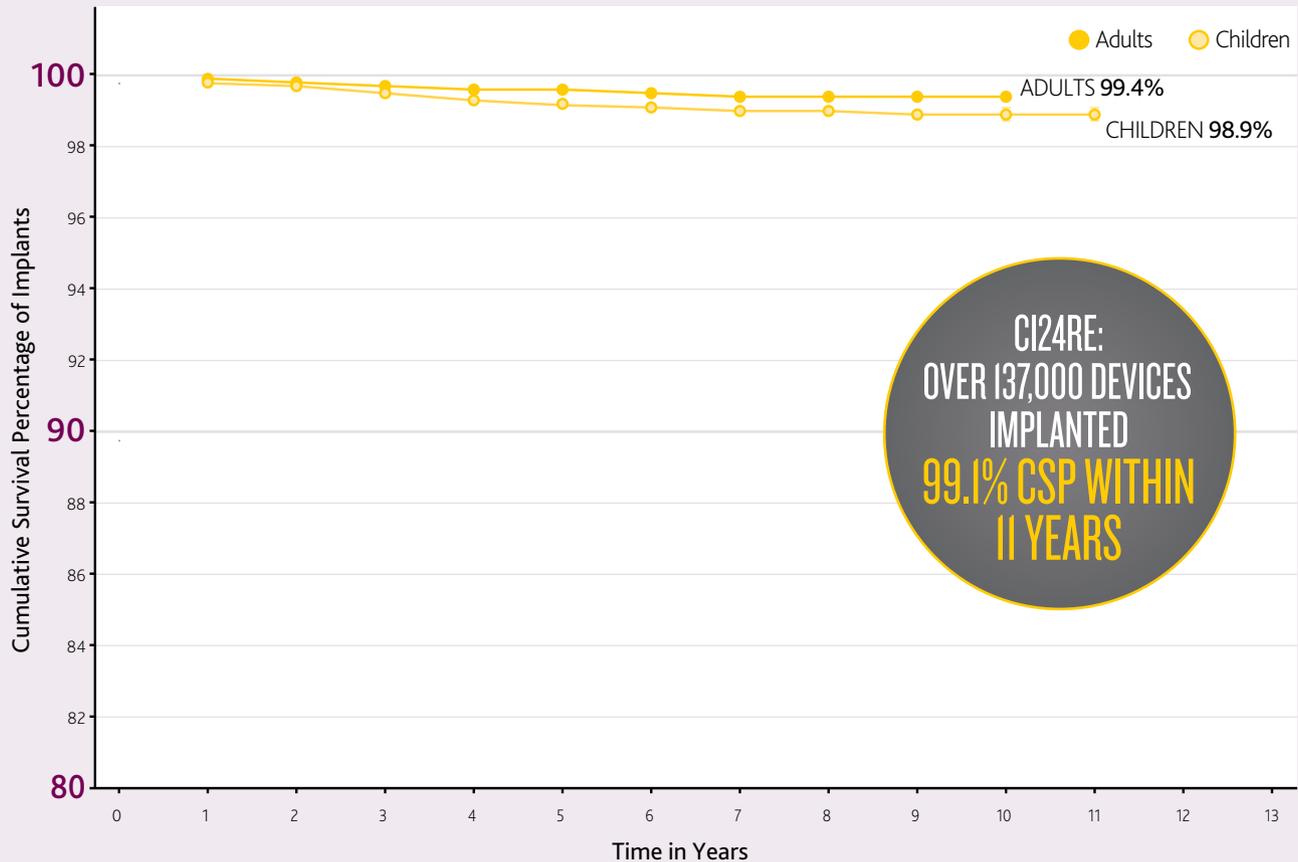
Released in 2005, it has a record of 99.1% combined Cumulative Survival Percentage within 11 years.

## CI24RE Series Cumulative Survival Percentage

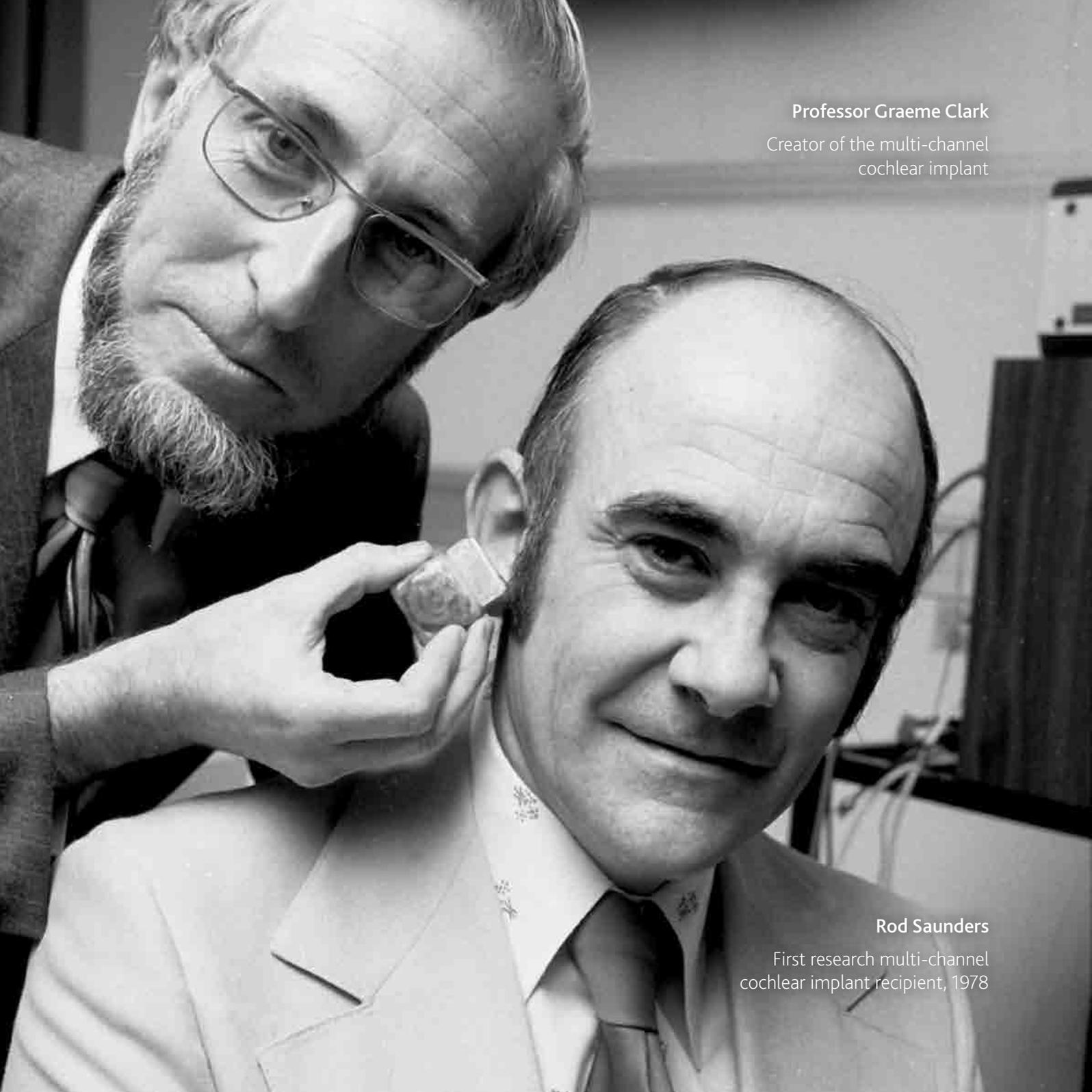
YEARS	1	2	3	4	5	6	7	8	9	10	11
Adults	99.9	99.8	99.7	99.6	99.6	99.5	99.4	99.4	99.4	99.4	#
Children	99.8	99.7	99.5	99.3	99.2	99.1	99.0	99.0	98.9	98.9	98.9
Combined	99.8	99.7	99.6	99.5	99.4	99.3	99.2	99.2	99.1	99.1	99.1

# Individual populations less than the minimum required for a valid calculation.

## CI24RE Series Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015



**Professor Graeme Clark**  
Creator of the multi-channel  
cochlear implant

**Rod Saunders**  
First research multi-channel  
cochlear implant recipient, 1978

# PREVIOUS GENERATION IMPLANT DATA

# NUCLEUS CI500 SERIES IMPLANT



## Number of registered CI500 Series implants - 23 February 2015

ADULTS	CHILDREN	COMBINED
15,382	14,372	29,754

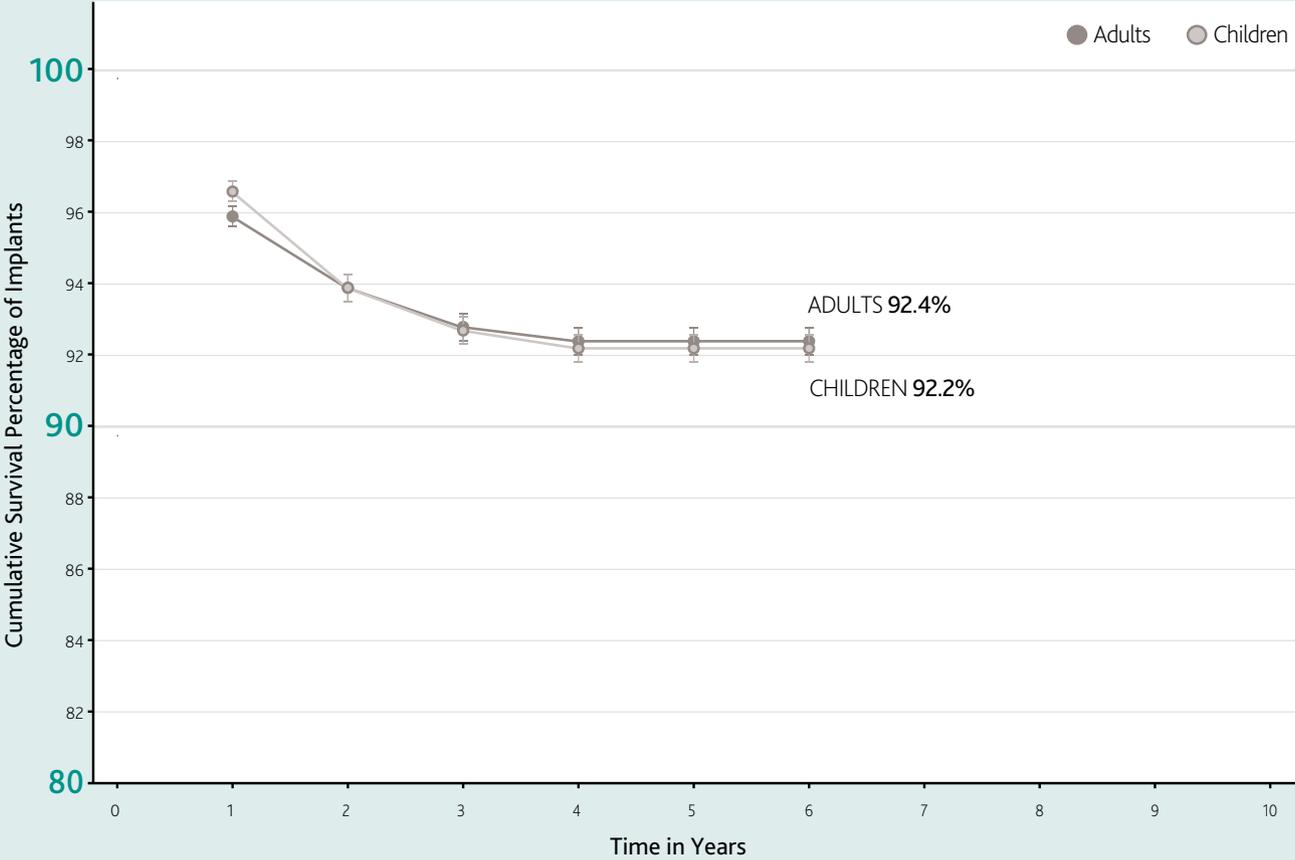
Released in 2009, the CI500 Series has a combined Cumulative Survival Percentage of 92.3% within six years.

The CI500 Series was voluntarily recalled in September 2011.

## CI500 Series Cumulative Survival Percentage

YEARS	1	2	3	4	5	6
Adults	95.9	93.9	92.8	92.4	92.4	92.4
Children	96.6	93.9	92.7	92.2	92.2	92.2
Combined	96.2	93.9	92.8	92.3	92.3	92.3

# CI500 Series Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015

# NUCLEUS CI24R IMPLANT



## Number of registered CI24R implants - 23 February 2015

ADULTS	CHILDREN	COMBINED
18,828	34,354	53,182

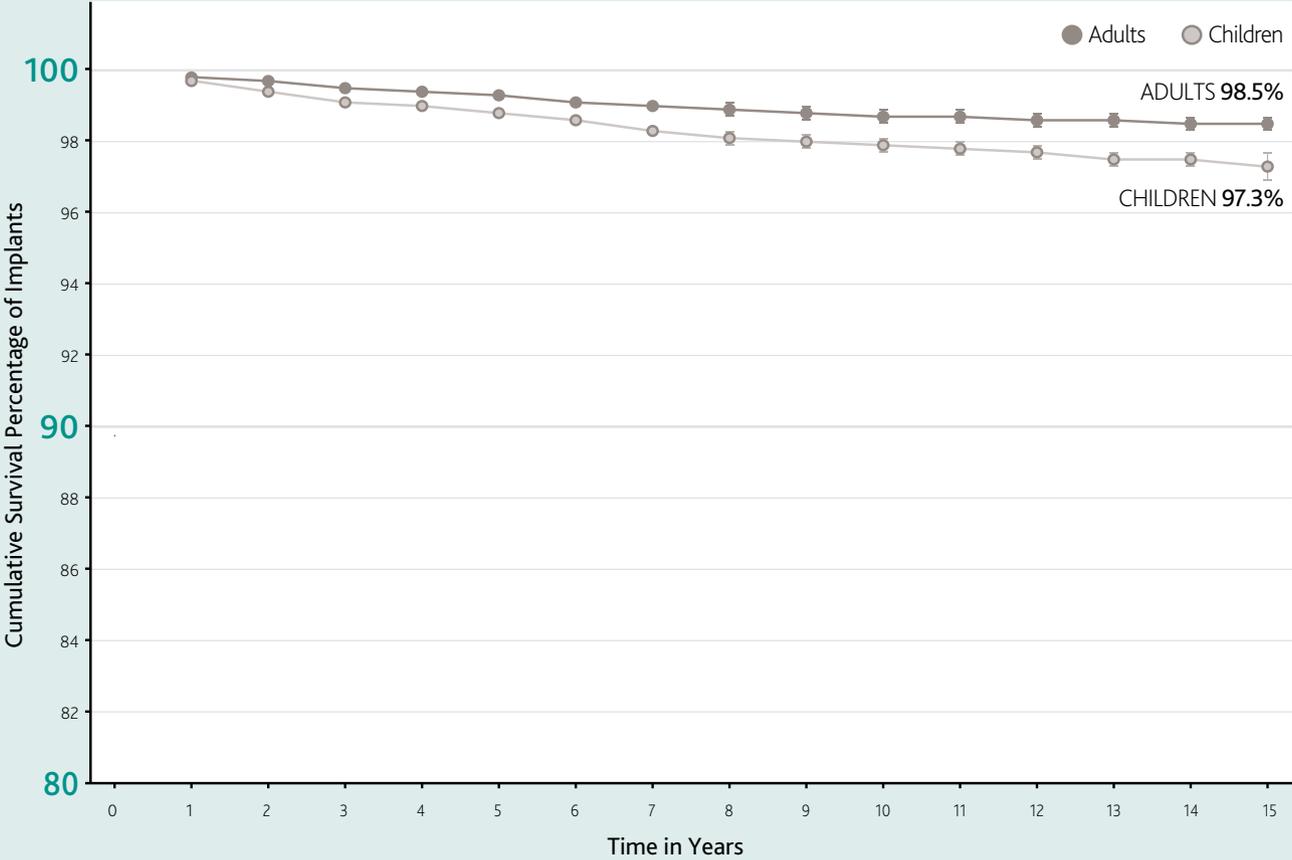
The CI24R was released in 2000 with perimodiolar (Contour Advance®) and straight electrodes.

Within 15 years, the CI24R implant has a combined Cumulative Survival Percentage of 97.8%.

## CI24R Cumulative Survival Percentage

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Adults	99.8	99.7	99.5	99.4	99.3	99.1	99.0	98.9	98.8	98.7	98.7	98.6	98.6	98.5	98.5
Children	99.7	99.4	99.1	99.0	98.8	98.6	98.3	98.1	98.0	97.9	97.8	97.7	97.5	97.5	97.3
Combined	99.7	99.5	99.3	99.1	98.9	98.8	98.6	98.4	98.3	98.2	98.1	98.1	97.9	97.9	97.8

# CI24R Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015

# NUCLEUS CI24M IMPLANT



## Number of registered CI24M implants - 23 February 2015

	ADULTS	CHILDREN	COMBINED
ALL	7,888	11,788	19,676
POST**	6,170	9,278	15,448

Released in 1997, the CI24M implant was the world's first cochlear implant with a removable magnet for MRI safety.

Within 18 years, the CI24M implant has a combined Cumulative Survival Percentage of 96.9%.

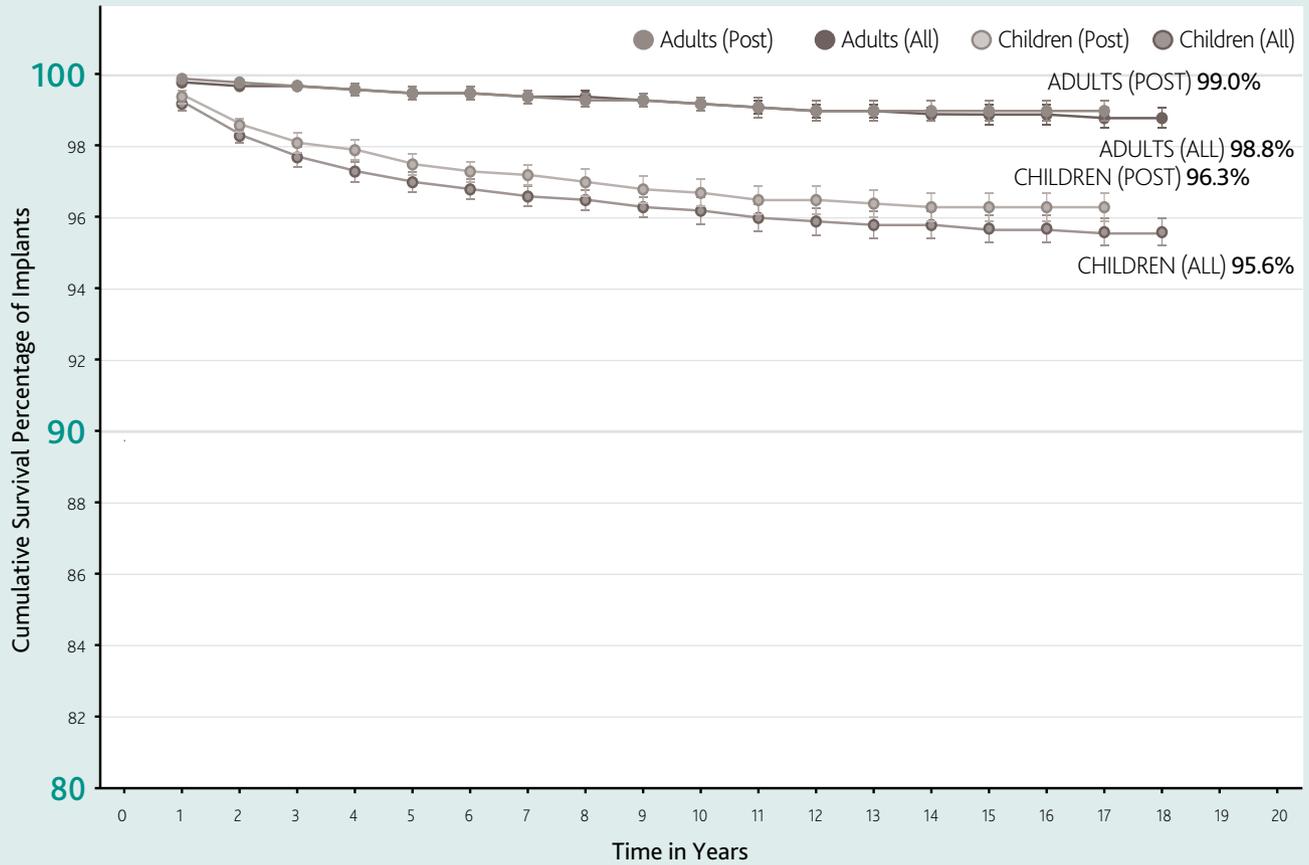
## CI24M Cumulative Survival Percentage

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Adults (All)	99.8	99.7	99.7	99.6	99.5	99.5	99.4	99.4	99.3	99.2	99.1	99.0	99.0	98.9	98.9	98.9	98.8	98.8
Children (All)	99.2	98.3	97.7	97.3	97.0	96.8	96.6	96.5	96.3	96.2	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
Adults (Post)	99.9	99.8	99.7	99.6	99.5	99.5	99.4	99.3	99.3	99.2	99.1	99.0	99.0	99.0	99.0	99.0	99.0	#
Children (Post)	99.4	98.6	98.1	97.9	97.5	97.3	97.2	97.0	96.8	96.7	96.5	96.5	96.4	96.3	96.3	96.3	96.3	#
Combined	99.5	98.9	98.5	98.2	98.0	97.9	97.8	97.6	97.5	97.3	97.2	97.1	97.1	97.0	97.0	97.0	96.9	96.9

\*\* 'Post' refers to the addition of a structural support component to improve impact strength.

# Individual populations less than the minimum required for a valid calculation.

## CI24M Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015

# NUCLEUS CI22M IMPLANT



## Number of registered CI22M implants - 23 February 2015

ADULTS	CHILDREN	COMBINED
9,971	8,212	18,183

Released in 1985, the CI22M implant was the first commercially available multi-channel cochlear implant in the world.

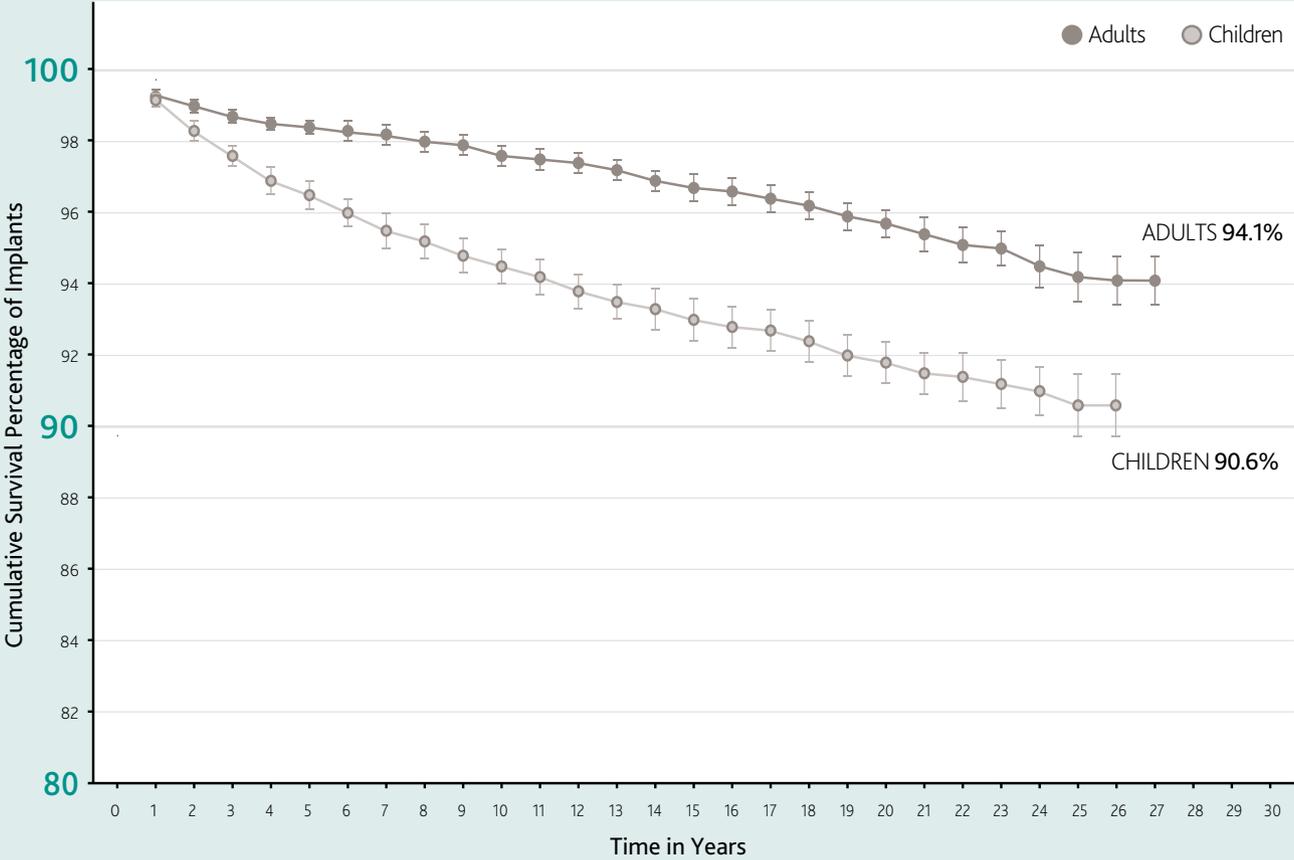
Within 28 years, the CI22M implant has a combined Cumulative Survival Percentage of 92.4%.

## CI22M Cumulative Survival Percentage

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Adults</b>	99.3	99.0	98.7	98.5	98.4	98.3	98.2	98.0	97.9	97.6	97.5	97.4	97.2	96.9
<b>Children</b>	99.2	98.3	97.6	96.9	96.5	96.0	95.5	95.2	94.8	94.5	94.2	93.8	93.5	93.3
<b>Combined</b>	99.3	98.7	98.2	97.8	97.5	97.2	97.0	96.7	96.5	96.2	96.0	95.7	95.5	95.3
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	96.7	96.6	96.4	96.2	95.9	95.7	95.4	95.1	95.0	94.5	94.2	94.1	94.1	#
	93.0	92.8	92.7	92.4	92.0	91.8	91.5	91.4	91.2	91.0	90.6	90.6	#	#
	95.0	94.9	94.7	94.5	94.1	93.9	93.6	93.4	93.2	92.8	92.5	92.4	92.4	92.4

# Individual populations less than the minimum required for a valid calculation.

# CI22M Reliability



REGISTERED IMPLANT DATA FOR ADULTS AND CHILDREN AS OF 23 FEBRUARY 2015

# APPENDIX

## GRAPHICAL REPRESENTATION

Each graph represents a type of device based on the receiver/stimulator portion.

RECEIVER/ STIMULATOR	IMPLANTS*
Profile Series	Cochlear Nucleus Profile with Contour Advance Electrode (CI512) Cochlear Nucleus Profile with Slim Straight Electrode (CI522)
CI24RE Series	Nucleus Freedom® with Contour Advance Electrode Nucleus Freedom with Straight Electrode Cochlear Nucleus CI422 cochlear implant Cochlear Hybrid™ L24 cochlear implant
CI500 Series	Cochlear Nucleus CI512 cochlear implant Cochlear Nucleus CI513 cochlear implant Cochlear Nucleus CI551 cochlear implant Cochlear Nucleus ABI541 Auditory Brainstem Implant
CI24R	Nucleus 24 with Contour Advance Electrode Nucleus 24 with Contour® Electrode Nucleus 24k with Straight Electrode
CI24M	Nucleus 24 with Straight Electrode Nucleus 24 with Double Array Nucleus 24 Auditory Brainstem Implant [ABI]
CI22M	Nucleus 22

\* Implant availability varies by market.

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4. 2014 Reliability report: credibility in reporting [Internet]. Stäfa (Switzerland): Advanced Bionics AG; 2014 [cited 2015 Mar 23]; Available from: [http://www.advancedbionics.com/content/dam/ab/Global/en\\_ce/documents/candidate/AB\\_Reliability\\_Report.pdf](http://www.advancedbionics.com/content/dam/ab/Global/en_ce/documents/candidate/AB_Reliability_Report.pdf).
5. Honest, transparent, up-to-date product reliability reporting [Internet]. Vienna (Austria): MED-EL GmbH [updated 2014 October; cited 2015 Mar 23]. Available from: <http://www.medel.com/us/reliability-reporting/>



# Hear now. And always

As the global leader in implantable hearing solutions, Cochlear is dedicated to bringing the gift of sound to people with moderate to profound hearing loss. We have helped over 350,000 people of all ages live full and active lives by reconnecting them with family, friends and community.

We give our recipients the best lifelong hearing experience and access to innovative future technologies. For our professional partners, we offer the industry's largest clinical, research and support networks.

That's why more people choose Cochlear than any other hearing implant company.



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