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## **Brain Death and Organ Donation**

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The Kingdom of Saudi Arabia has an active cadaveric transplant program under the supervision of the Saudi Center for Organ Transplantation. Clear policies have been laid down to facilitate diagnosis of brain-death and management of potential organ donors.

Religious Scholars approved the concept of brain-death and organ donation.

At the end of the year 2008, a total of 6990 brain-death cases have been reported to SCOT of which 533 were reported during year 2008 from 83 intensive care units around the Kingdom. An average of 463 cases per year was detected in the last 5 years. Male to female ratio was 4 to 1 respectively. Ages below 40 years formulated 68.9% of the donors.

Head injuries constituted 51.4% of the causes of death. while non-traumatic causes were reported in 40% of the cases, resulting mostly from cerebrovascular accidents i.e. 72% and brain anoxia in 20%.

Road traffic accidents constituted 43.9% of the circumstances that lead to death. Of the direct causes of death, intracerebral hemorrhage was found in 82.4%.

The number in which documentation could not be completed in year 2008 was 174 i.e. 32.6% of the reported cases. The reasons behind that are:

1. Cardiac arrest after 48 hours, yet the protocol could not be applied in 37.1%.
2. Persistence of EEG activity until cardiac arrest in 4.8%.
3. Cardiac arrest within 24 hours from time of reporting in 14%.
4. Cardiac arrest within 48 hours of reporting in 44.1%

Of the 533 reported cases in the year 2008, 359 (67.3%) could be medically documented. Of these cases, the family had been approached in 282 and 118 of them gave consent for organ donation (i.e. 41.8% of the approached families). While family refusal constituted 57.8%. Retrieval was carried out in 89% of consented cases.

Cardiac arrest and multi-system failure constituted the common medical causes and family refusal, the overall commonest cause of failure to retrieve organs.

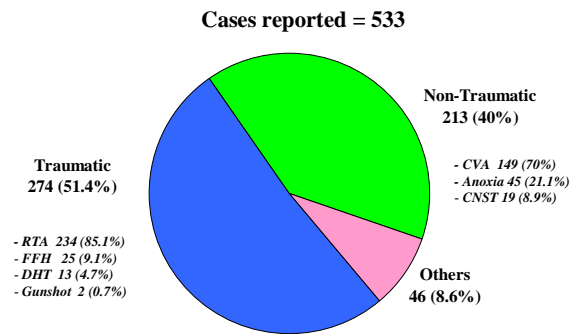
Management of all reported brain dead cases was followed up by the SCOT with different ICU's in the Kingdom. This usually ends up when death is declared following irreversible cardio-pulmonary arrest.

The duration of stay of brain dead cases in the ICU's till organ retrieval or cardiac arrest ranged from 24 hours to 77 days (mean 10.1 days). The mean duration between admission and reporting of brain dead cases was 5.5 days (8 hours – 48 days), from reporting to documentation was 1.4 days, (12 hours – 31 days). However the rate of stay for brain dead cases in the ICU's from documentation till irreversible cardiac arrest takes place averaged  $4.4 \pm 6$  days (ranging from one hour to 77 days).

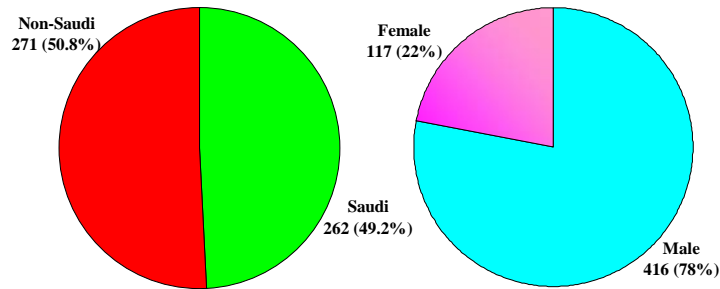
It was noticed that 100% of the total consents included kidneys as donated organs; liver was donated in 97% and heart in 79% of the successful cases. Total cornea donation was the least, it reached only 35%.

More energetic measures are still required to increase reporting of brain death cases as well as obtaining consent. Only this will help bridging the gap between supply and demand of organs given that more than 2700 patients are in the active waiting list for organ transplantation.

## Cause of Brain-Death in the Reported Cases Year 2008



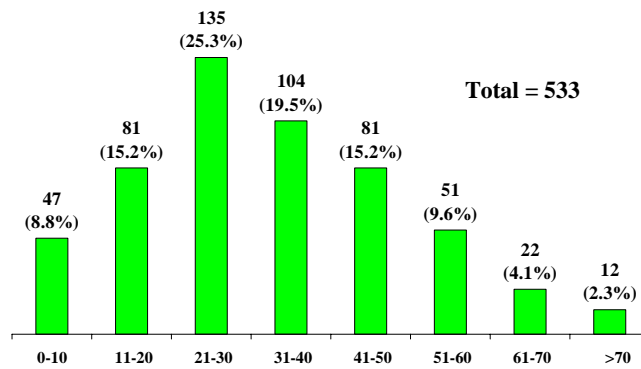
## Brain-Death Cases Nationality and Sex - Cases Reported Year 2008



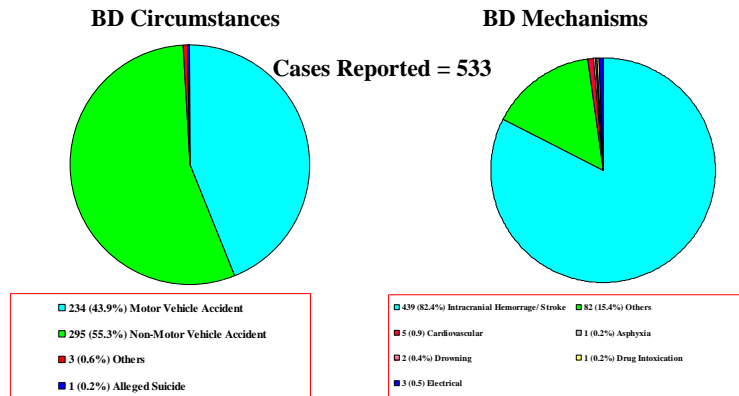
Total Reported = 533



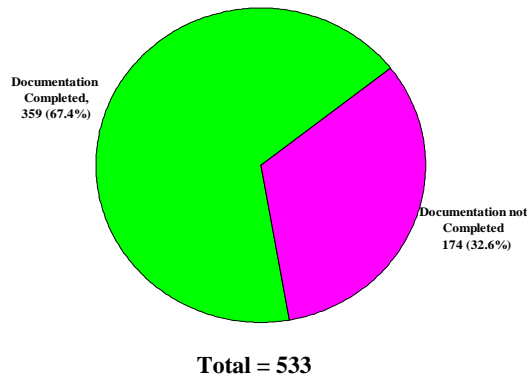
## Brain-Death Cases Age Distribution of Cases Reported 2008



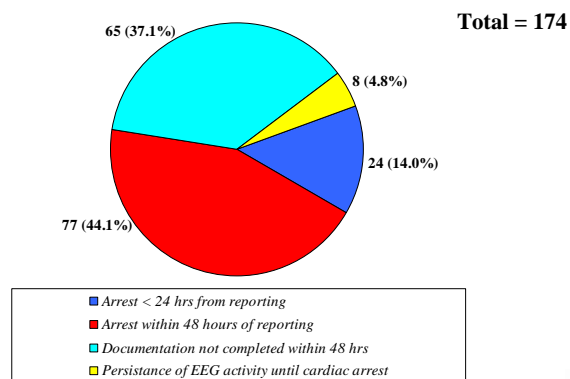
## Brain-Death Circumstances and Mechanisms Year 2008



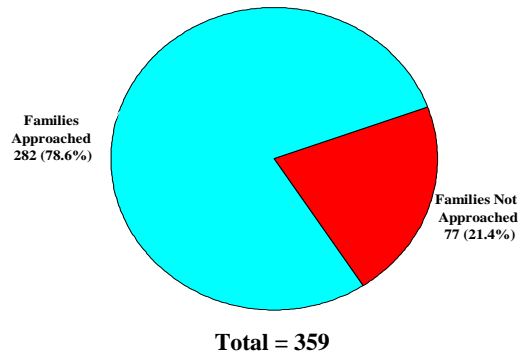
### Reported Brain Death Cases: Documented/Not Documented 2008



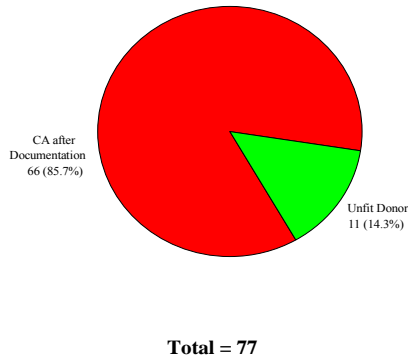
### Causes of Failure to Complete the Documentation of Brain-Death Year 2008



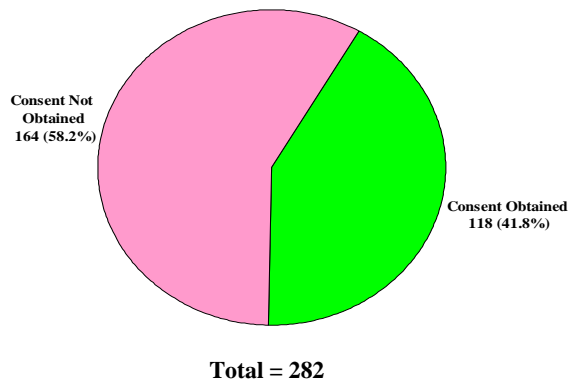
**Documented Brain Death Cases:  
Families Approached/Not Approached 2008**



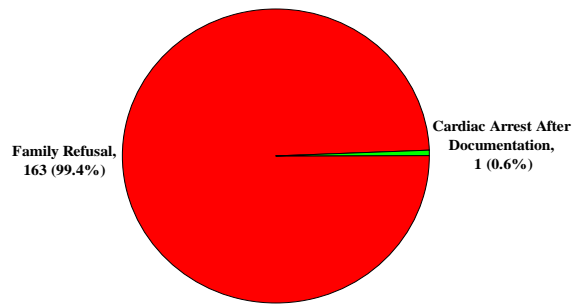
**Reasons of Failure to Approach Families  
2008**



**Families Approached Brain Death Cases:  
Consented/Not Consented for Donation 2008**



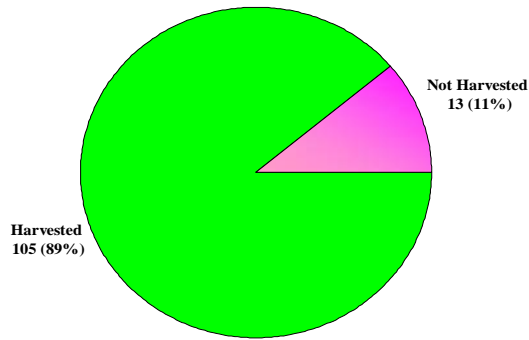
### Reasons of Failure to Get Consent 2008



Total = 164



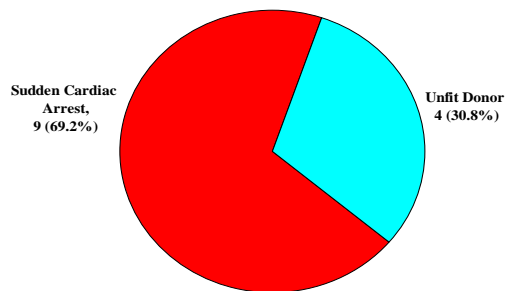
### Consented Brain Death Cases: Harvested/Not Harvested 2008



Total = 118



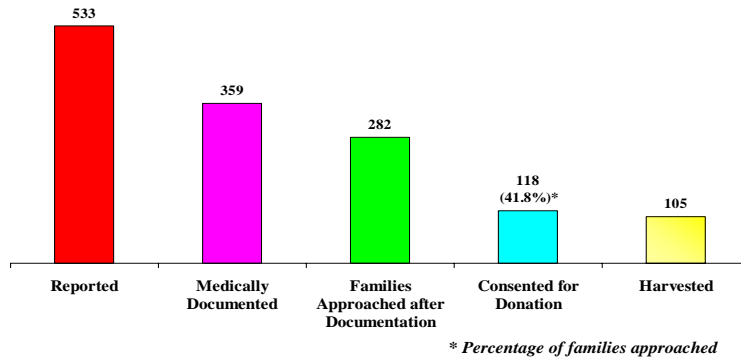
### Reasons of Not Harvesting Organs 2008



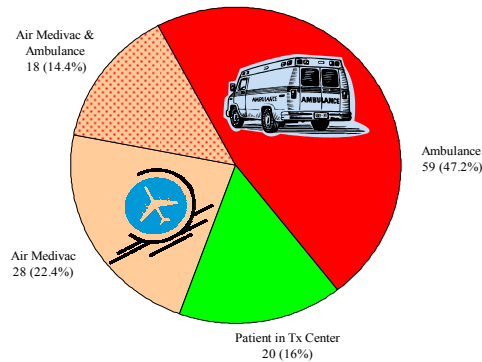
Total = 13



## Brain-Death Cases Reported, Medically Documented, Families Approached, Consented for Donation and Harvested Year 2008



### Use of Medivac in Harvesting of Organs 2008



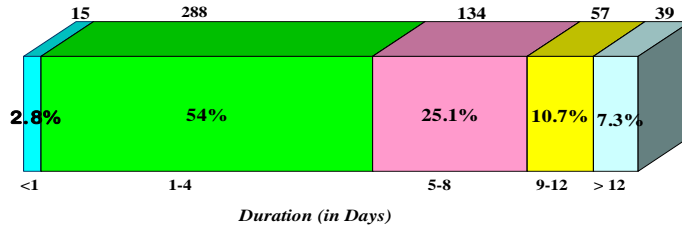
Total = 125

### Brain-Death Cases Reported, Medically Documented, Families Approached, Consented for Donation and Harvested According to Region 2008

Region Name	Reported	Documented	Families Approached	Consented	Harvested
Central	281	207	179	78	70
Western	83	42	26	6	6
Eastern	49	30	21	4	4
Northern	31	20	12	5	3
Southern	57	30	16	7	7
Outside KSA	32	30	28	18	15
<b>Total</b>	<b>533</b>	<b>359</b>	<b>282</b>	<b>118</b>	<b>105</b>

### Time in ICU From Admission to Reporting for Brain Death Cases 2008

Mean: 5.5 Days (8 hours – 48 Days)

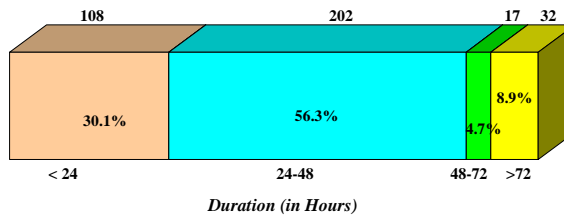


Total Reported Cases = 533



### Time in ICU From Reporting to Documentation for Brain Death Cases 2008

Mean: 1.4 Days (12 hours – 31 Days)

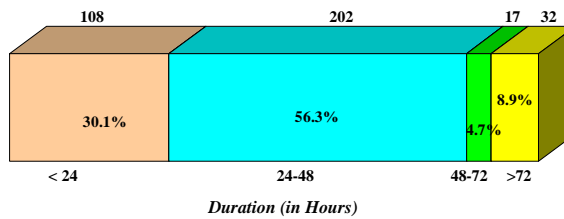


Total Documented Cases = 359



### Time in ICU From Reporting to Documentation for Brain Death Cases 2008

Mean: 1.4 Days (12 hours – 31 Days)

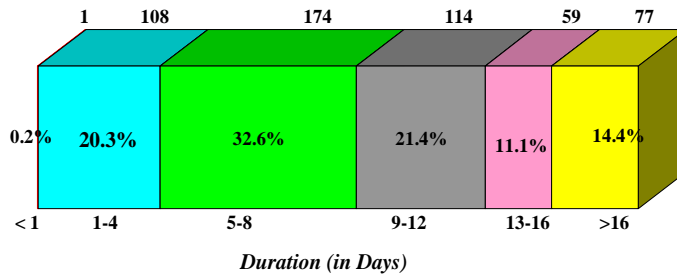


Total Documented Cases = 359



## Time in ICU From Admission to Harvesting/Cardiac Arrest for Brain Death Cases 2008

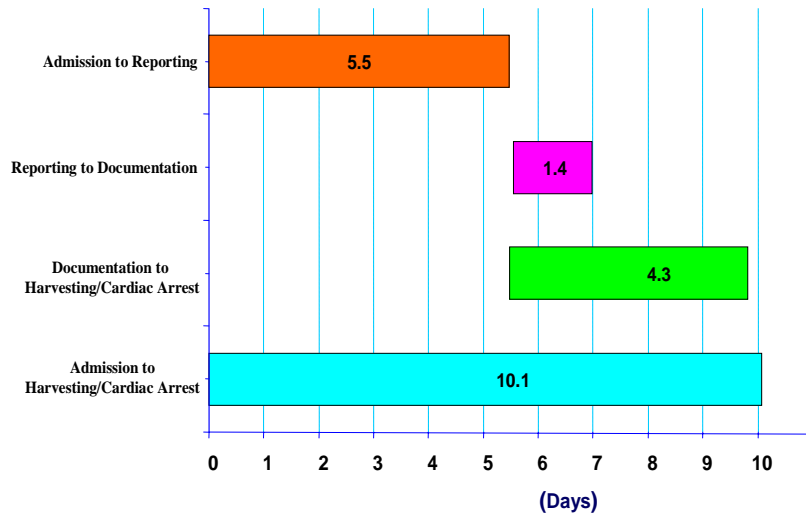
Mean: 10.1 Days (24 hours – 77 Days)



Total Reported Cases = 533

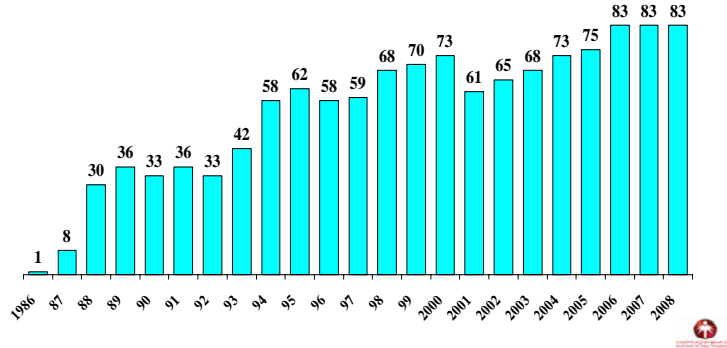


## Average Time in ICU for Brain Death Cases 2008



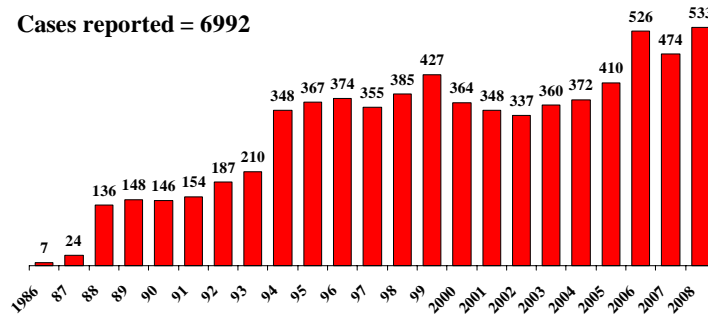
## Annual Trend of Number of ICUs Contributing in Cadaveric Donation Program 1986 - 2008

Current total number of active ICUs in Saudi Arabia = 116



## Trend of Brain-Death Cases Reported over the Years 1986 - 2008

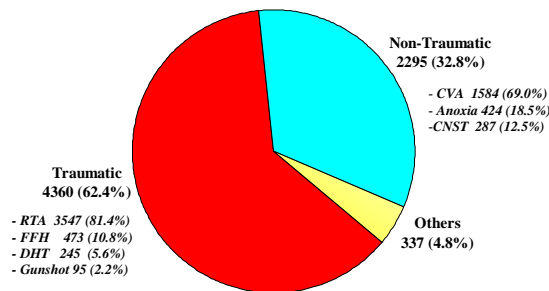
Cases reported = 6992



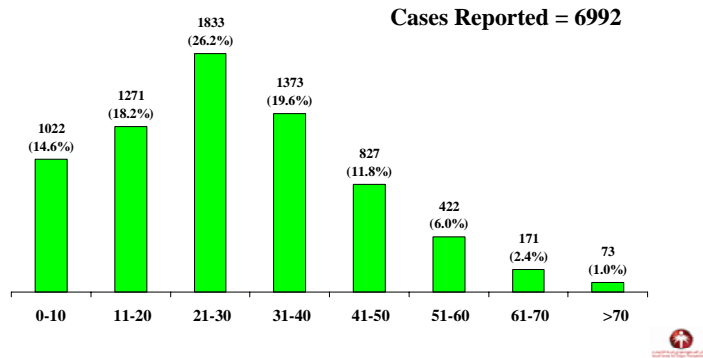
\* Average cases reported in the last 5 years : 463 /year

## Cause of Brain-Death in the Reported Cases 1986 - 2008

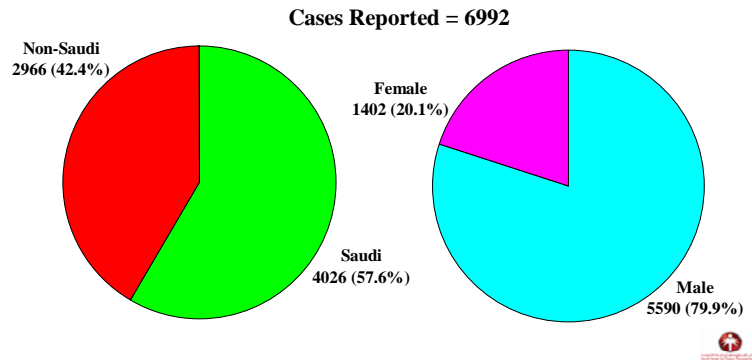
Cases reported = 6992



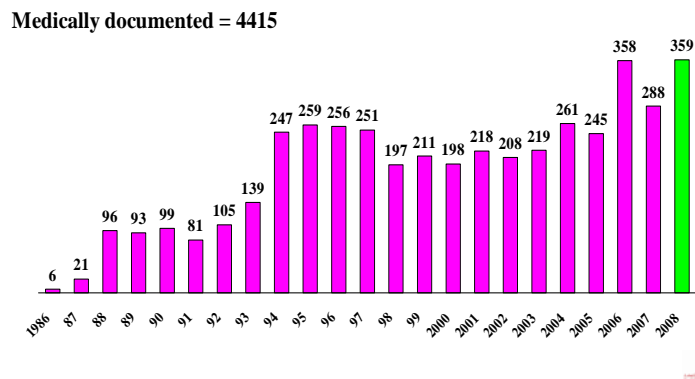
### Brain-Death Cases Age Distribution of Cases Reported 1986 - 2008



### Brain-Death Cases Nationality and Sex - Cases Reported 1986 - 2008

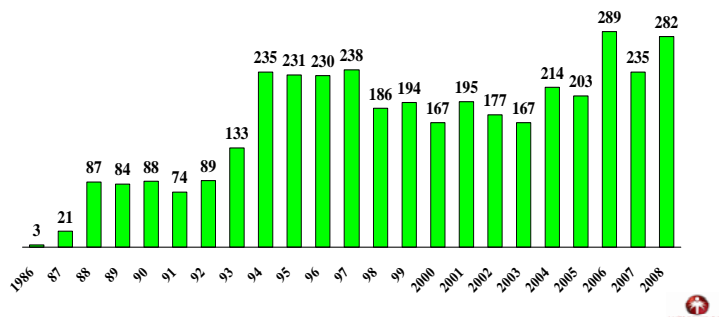


### Trend of Medically Documented Cases over the Years 1986 - 2008

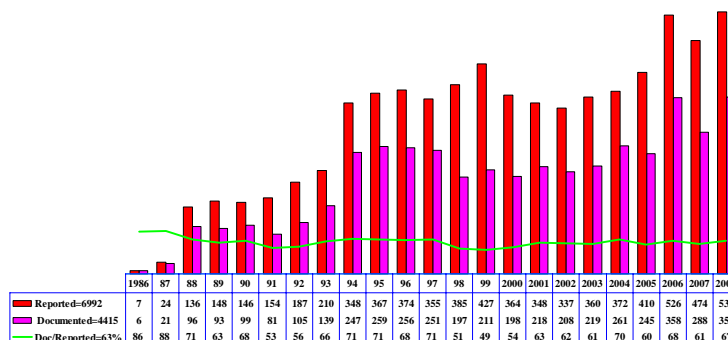


## Brain-Death Cases Trend of Families Approached after Documentation 1986 - 2008

Families approached = 3822

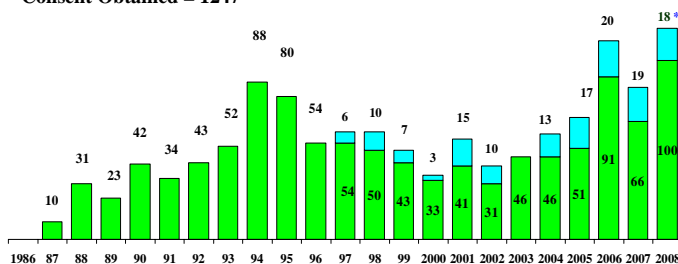


## Correlation Between Reported and Medically Documented Brain-Death Cases 1986 - 2008



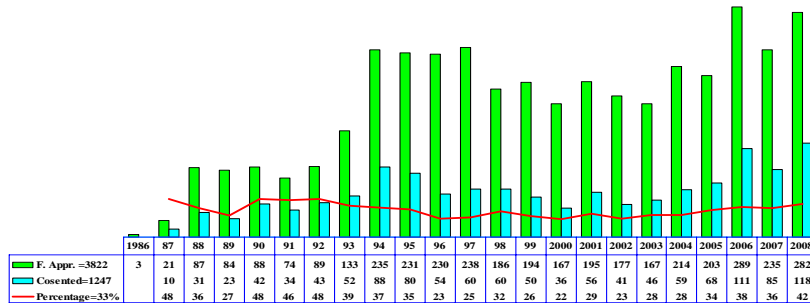
## Brain-Death Cases Trend of Consented for Donation 1986 - 2008

Consent Obtained = 1247



\* Cases from Organ Sharing Program (Spain, Kuwait, Qatar and Bahrain)

### Brain-Death Cases Correlation Between Families Approached after Documentation and Consented for Donation 1986 - 2008

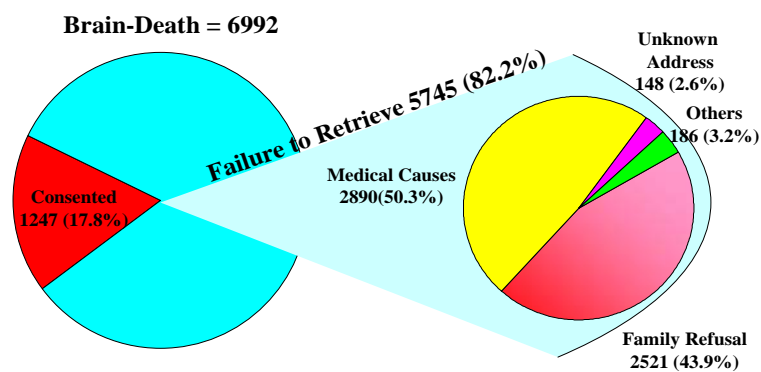


### Brain-Death Cases Trend of Harvested 1986 - 2008

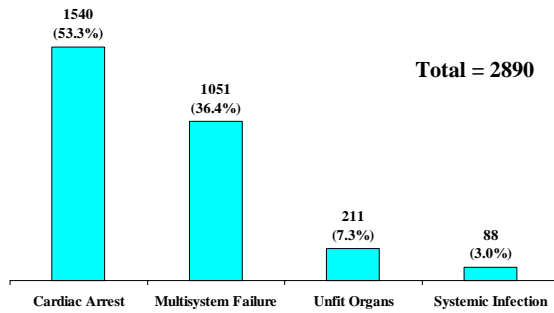
Harvested = 1145



### Failure to Retrieve Organs 1986 - 2008



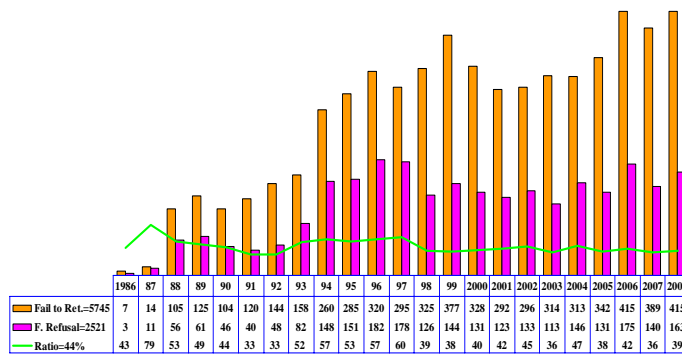
### Medical Causes of Failure to Retrieve Cadaveric Organs 1986 - 2008



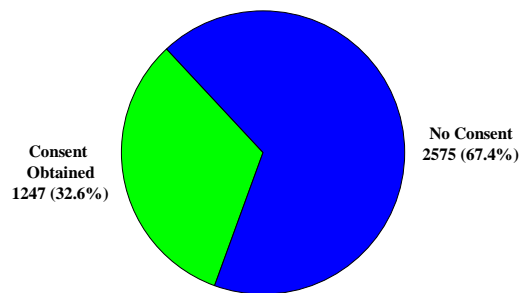
\*The multi-system failure was due in 50% of the cases to the delay in confirming the diagnosis of brain-death (persistence of electrical activity in the electroencephalogram)



### Trend of Contribution of Family Refusal Towards Failure to Retrieve Organs 1986 - 2008



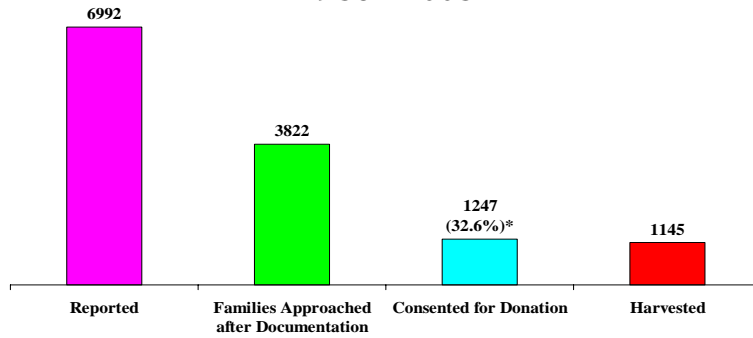
### Consent Obtained in Medically Documented Brain-Death Cases with Approachable Families 1986 - 2008



Total = 3822



**Brain-Death Cases  
Reported, Families Approached,  
Consented for Donation and Harvested  
1986 - 2008**



*\* Percentage of families approached*



## **Hospitals Sharing in Organ Donation Program**

The total number of hospitals reported potential brain death cases during the year 2008 were 83 hospitals. These were divided into either large (>20 ICU's beds), medium (10-20 ICU's beds) or small (<10 ICU's beds).

Large hospitals (8) reported 116 cases (21.8% of the total). 79% of these reported cases were fully documented and 27 consented cases were obtained for organ donation (22.9%).

In this group, 17 consents were obtained from King Saud Medical Complex (KSMC). So KSMC was considered to be the largest source of consented cases in the Kingdom for the last three years. King Abdulaziz Medical City (National Guard Hospital) -Riyadh came next with 7 consents followed by King Khalid University Hospital-Riyadh with 3 cases.

Medium sized hospitals, (with ICU beds 10-20) reported 38.6% (206 cases) of the total number of reported cases. However only 35 (29.6%) consents were obtained for organ donation from this group of hospitals.

The most active hospital in this group was Prince Salman Hospital-Riyadh with 9 consented cases followed by Riyadh Care Hospital and King Fahd Hospital - Al Baha with 5 consents each. Three consents were obtained from each of the following: King Fahd Specialist Hospital - Qassim, King Khalid Hospital - Tabuk and King Khalid Hospital - Al Kharj, followed by King Khalid National Guard Hospital - Jeddah with two consents. One consent was obtained from each of the following: King Fahd Hospital - Gizan, King Fahd Hospital - Madina, King Khalid Hospital - Hail, Assir Central Hospital and King Abdulaziz Specialist Hospital - Taif.

Small sized hospitals (ICU beds less than 10) came with a contribution of 179 reported cases (33.6% of the total). 38 consents were obtained from this group i.e. (32.2%).

Among this group, Al-Iman General Hospital-Riyadh was the most active with 9 consented cases, followed by Dallah Hospital- Riyadh with 4 cases of consent and Kingdom Hospital with three cases. Two consents was obtained from each of the following: Obeid Specialized Hospital- Riyadh, Afif General Hospital- Riyadh and King Saud Hospital- Unaiza.

Activities of the organ sharing program between the Kingdom and other countries shows that 12 consented cases were reported from Kuwait hospitals, 5 from Qatar hospitals and 1 from the Kingdom of Bahrain hospitals.

The following table shows the distribution of reported, consented and harvested cases according to region:

<b>Region</b>	<b>Reported Cases</b>	<b>Consented Cases</b>	<b>Harvested Cases</b>
Central (Riyadh, Kharj, Qassim, Hail)	284	79	70
Western (Jeddah, Makkah, Madinah, Taif)	83	6	6
Southern	57	7	7
Eastern	49	4	4
Northern	28	4	3
Outside KSA	32	18	15
<b>Total</b>	<b>533</b>	<b>118</b>	<b>105</b>

Distribution of consent cases according to region shows that 79 (67%) out of 118 consent cases were obtained from the central region (53 from MOH hospitals, 10 from Govt. Non-MOH hospitals and 16 from private sector hospitals). The southern region came next with 7 (5.9%) consents followed by the Western region with 6 (5.08%) consents. The Northern and the Eastern regions each reported 4 cases of consent. Besides, 18 consents were obtained from outside the Kingdom (Kuwait, Qatar and Kingdom of Bahrain).

**Brain Death Cases Reported, Medically Documented, Families Approached, Consented for Organ Donation and Harvested from Different Hospitals in Saudi Arabia in 2008**

**Table (1): Hospitals with ICU's Having More than 20 Beds**

<b>No.</b>	<b>Hospital Name</b>	<b>Reported Cases</b>	<b>Medically Documented</b>	<b>Families Approached after Documentation</b>	<b>Consented</b>	<b>Harvested</b>
1	King Saud Medical Complex	55	46	41	17	16
2	King Abdulaziz Medical City and National Guard Hospital-Riyadh	20	17	17	7	7
3	King Khalid University Hospital-Riyadh	13	9	8	3	3
4	Armed Forces Hospital-Riyadh (RKH)	12	9	8	0	0
5	North West Armed Forces Hospital-Tabuk	5	5	3	0	0
6	King Fahd Hospital-Jeddah	5	2	0	0	0
7	King Faisal Specialist Hospital-Riyadh	4	2	1	0	0
8	Security Forces Hospital - Riyadh	2	2	2	0	0
<b>Total</b>		<b>116 (21.8%)</b>	<b>92</b>	<b>80</b>	<b>27 (22.9%)</b>	<b>26</b>

**Table (2): Hospitals with ICU's Having 10 and 20 Beds**

No.	Hospital Name	Reported Cases	Medically Documented	Families Approached after Documentation	Consented	Harvested
1	Prince Salman Hospital	24	19	18	9	7
2	Assir Central Hospital - Abha (1)	20	9	4	1	1
3	King Fahd Specialist Hospital-Buraidah	19	10	8	3	3
4	Dammam Medical Complex	19	10	4	0	0
5	Al Noor Specialist Hospital-Makkah	14	7	3	0	0
6	King Fahd Hospital-Madinah	14	9	6	1	1
7	King Fahd Hospital-Gizan	13	5	2	1	1
8	King Khalid Hospital-Al-Kharj	13	8	8	3	2
9	King Fahd Hospital-Al-Baha	12	12	9	5	5
10	Riyadh Care Hospital	11	10	8	5	5
11	King Khalid Hospital-Tabuk	9	6	3	3	2
12	King Fahd Medical City - Riyadh	7	3	2	0	0
13	King Faisal Military Hospital-Khamis Mushyat	5	1	0	0	0
14	King Abdulaziz Hospital-Jeddah	5	2	2	0	0
15	King Khalid National Guard Hospital-Jeddah	3	3	3	2	2
16	Al Hada Military Hospital-Taif	3	2	0	0	0
17	King Khalid Hospital-Hail	3	1	1	1	0
18	King Abdulaziz Specialist Hospital-Taif	3	1	1	1	1
19	King Fahd University Hospital- Al Khobar	2	2	1	0	0
20	King Fahd Hospital- Hofuf	2	1	1	0	0
21	Al Yamama Hospital-Riyadh	1	1	0	0	0
22	Al Qurayyat General Hospital	1	1	1	0	0
<b>Total</b>		<b>203 (38.1%)</b>	<b>123</b>	<b>85</b>	<b>35 (29.7%)</b>	<b>30</b>

**Table (3): Hospitals with ICU's Having Less than 10 Beds**

No.	Hospital Name	Reported Cases	Medically Documented	Families Approached after Documentation	Consented	Harvested
1	Al-Iman General Hospital - Riyadh	32	21	16	9	8
2	Dr. Abdulrahman Al Mishari Hospital - Riyadh	3	3	2	0	0
3	King Khalid Hospital-Hafr Al-Batin	14	7	5	1	1
4	Ara'r Central Hospital	10	7	4	1	1
5	Afif General Hospital	8	6	6	2	2
6	King Saud Hospital-Unaiza	8	6	5	2	1
7	King Faisal Hospital-Taif	7	3	2	0	0
8	Dallah Hospital	6	6	5	4	4
9	National Hospital-Riyadh	6	5	5	1	1
10	Kingdom Hospital	5	5	5	3	3
11	Al Mana General Hospital-Dammam	5	5	5	1	1
12	Obeid Specialized Hospital-Riyadh	5	3	3	2	2
13	Rabiq General Hospital	5	3	2	0	0
14	Hotat Bani Tamim Hospital	4	4	3	1	1
15	King Fahd Armed Forces Hospital-Jeddah	4	3	3	0	0
16	Shagra General Hospital	4	3	1	1	1
17	King Faisal Hospital- Makkah	4	2	0	0	0
18	Wadi Dawassir General Hospital	4	1	1	1	1
19	Al Thager Hospital-Jeddah	3	1	1	1	1
20	Samtha General Hospital -Gizan	3	1	1	0	0
21	Al Qawaeyah General Hospital	2	2	1	1	1
22	Jubail General Hospital	2	2	2	1	1
23	Al Geddani Hospital- Jeddah	2	1	1	1	1
24	Al-Hammadi Hospital-Riyadh	2	2	1	0	0
25	Saad Specialist Hospital- Al Khobar	2	2	2	0	0
26	Al Hera General Hospital- Makkah	2	2	1	0	0
27	Beljurashi Hospital	2	2	0	0	0
28	Al Mouwasat Hospital-Riyadh	2	1	1	1	0

**Table (3): (... Contd) Hospitals with ICU's Having Less than 10 Beds**

No.	Hospital Name	Reported Cases	Medically Documented	Families Approached after Documentation	Consented	Harvested
29	Rumah General Hospital	2	1	1	1	0
30	King Faisal Specialist Hospital-Jeddah	2	0	0	0	0
31	Al Qateef Central Hospital	2	0	0	0	0
32	Al Qunfudah Hospital	2	0	0	0	0
33	Rafha General Hospital	2	0	0	0	0
34	Aramco Hospital- Dhahran	1	1	1	1	1
35	Dawadmi General Hospital	1	1	1	1	1
36	Hotat Sudair General Hospital	1	1	1	1	1
37	Maternity and Children Hospital-Jeddah	1	1	1	0	0
38	Madneb General Hospital	1	0	0	0	0
39	Prince Abdulrahman Al Sudeiry Hos.-Al-Jouf	1	0	0	0	0
40	Bugshan Hospital-Jeddah	1	0	0	0	0
41	Mohayel General Hospital	1	0	0	0	0
42	Wothailan General Hospital	1	0	0	0	0
43	Aflaj General Hospital	1	0	0	0	0
44	New Jeddah National Hospital	1	0	0	0	0
45	Wadi Dawassir Military Hospital	1	0	0	0	0
46	Yanbu General Hospital	1	0	0	0	0
47	Saudi German Hospital- Jeddah	1	0	0	0	0
48	Abu Arish General Hospital –Gizan	1	0	0	0	0
49	King Khalid General Hospital- Majmaah	1	0	0	0	0
<b>Total</b>		<b>182 (34.1%)</b>	<b>114</b>	<b>89</b>	<b>38 (32.2%)</b>	<b>34</b>

**Table (4): Hospitals Outside the Kingdom of Saudi Arabia**

<b>No.</b>	<b>Hospital Name</b>	<b>Reported Cases</b>	<b>Medically Documented</b>	<b>Families Approached after Documentation</b>	<b>Consented</b>	<b>Harvested</b>
1	Kuwait Hospitals	16	15	15	12	11
2	Qatar Hospitals	10	10	10	5	3
3	Bahrain Hospitals	5	4	3	1	1
4	Oman Hospital	1	1	0	0	0
<b>Total</b>		<b>32</b>	<b>30</b>	<b>28</b>	<b>18</b>	<b>15</b>

**Table (5): Total Number of Brain Death Cases for All Hospitals**

<b>Hospital Name</b>	<b>Reported Cases</b>	<b>Medically Documented</b>	<b>Families Approached after Documentation</b>	<b>Consented</b>	<b>Harvested</b>
Greater than 20 ICU Beds	116	92	80	27	26
10 - 20 ICU Beds	203	123	85	35	30
Less than 10 ICU Beds	182	114	89	38	34
Outside KSA	32	30	28	18	15
<b>Total</b>	<b>533</b>	<b>359</b>	<b>282</b>	<b>118</b>	<b>105</b>