

Epidemiology & Statistics

Associated with Limb Loss & Limb Deficiency

Category	Percentage
PVD	66%
Trauma	26%
Tumor	5%
Congenital	3%

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Objectives

Upon completion of this unit you will be able to:

- Recall basic terms & definitions used to explain the demographics of amputation and limb loss.
- Recall populations most at risk of limb loss
- Differentiate between causes of lower and upper extremity amputation
- Explain the impact of diabetes and foot ulcer on the number of individuals with limb loss
- Discuss how age and gender impact the amputee population
- Appreciate the significance of war on the number of amputees in both the number of soldiers and the persons native to the war torn countries
- Discuss differences in the amputee population between developing and developed countries

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Basic Definitions¹

- **Incidence**- frequency of occurrence of an event or condition in relation to a given population **within a period of time**
- **Prevalence**- number of cases of a disease present in a given population **at a given time**
- **Morbidity**- number of cases of a certain disease within a certain population
- **Mortality**- a ratio of the number of deaths within a given population

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How Many Live with Limb Loss??

1996:

- 1,285,000 persons in U.S. living with limb loss (excluding fingers and toes)
- Prevalence rate was 4.9/1,000 persons
- Incidence rate was 46.2/100,000 persons with dysvascular disease;
 - 5.86/100,000 persons secondary to trauma,
 - 0.35/100,000 secondary to malignancy of a bone or joint,
- Birth prevalence of congenital limb deficiency in 1996 was 25.64/100,000 live births.
- Prevalence rate is highest among people aged 65yrs & older ~ 19.4/1,000.

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Considerations

- What causes amputation?
 - Of the lower extremities (LE)?
 - Of the Upper extremities (UE)?
 - There are about 11 LE amputees to every UE amputee³
- What Levels of amputation are most common?
- Who is most at risk?



Photos courtesy of Otto Bock



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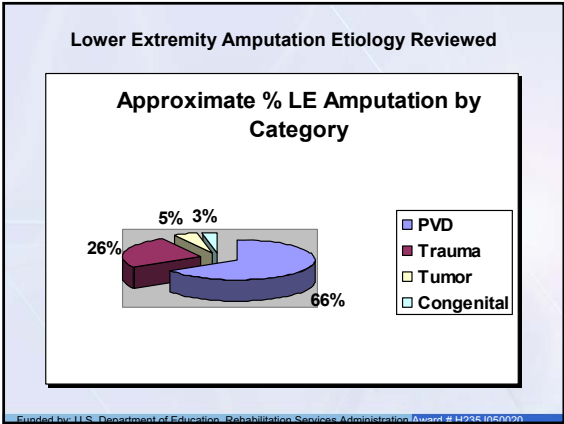
Processes Leading to Lower Extremity Amputation

- Peripheral Vascular Disease
- Diabetes
- Trauma
- Tumor/Cancer
- Congenital Deficiency and/or absence of a limb



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- ### Processes Leading to Lower Extremity Amputation
- Including some examples of possible cause and/or progression
- Peripheral Vascular Disease
 - Infection
 - Foot Ulcer
 - Diabetes
 - Infection
 - Foot Ulcer
 - Trauma
 - Unsalvageable crush injury
 - Complete or partial severing of a limb
 - Tumor/Cancer
 - Osteosarcoma
 - Congenital Deficiency and/or absence of a limb
 - Amniotic Band Syndrome
 - Drugs such as Thalidomide
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Overview of Processes Leading to Lower Extremity Amputation

- Peripheral Vascular Disease (PVD)-
 - Decreased circulation in the distal lower limb inhibits healing & immune response.
 - Foot trauma produces wound that does not heal
 - Infection may not heal and spread to bone
 - Infection may become life threatening if limb & infection are not removed
- Most common "subgroups" of PVD:
 1. Diabetic Complications
 2. Arteriosclerosis
 3. Thromboembolism
- 60-70% of amputations attributed to vascular disease⁴
 - 30% have contralateral limb involvement within 4yrs
 - 25% will die within 4yrs of amputation

Normal artery Artery narrowed by atherosclerosis
Blood flow Plaque

Photo from: <http://search.liv.com/images/>

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Overview of Processes Leading to Lower Extremity Amputation

Diabetes-

- Can lead to micro & macrovascular disease and neuropathic and/or asensate feet.
 - Charcot foot deformities may result from trauma to an asensate foot
 - Deformed foot overloads tissue leading to ulceration.
 - Ulceration and poor circulation set up similar processes seen in cases of non-diabetic PVD
- > 18 million people in U.S. diagnosed with diabetes
 - Only 2-5% of the population yet this is nearly half of the amputee population
- As an example, there are ≈1 million persons living with diabetes in Texas
 - 1/3 cases of diabetes are undiagnosed⁵⁻⁸



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More on Diabetes & Foot Ulcer:

Due to their high involvement in LE amputation...

- 2000-02: ≈11.8% of U.S. adults with diabetes had history of foot ulcer⁹
- Foot ulcers account for > 20% of hospital admissions in diabetics/year
 - #1 reason for hospital visits in diabetic population^{9,10}



Photo from:

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Wounds, Diabetes & Amputation

- In the coming year, 70-86,000 persons will undergo LE amputation for chronic foot ulcer^{6,11}
- 85% of all amputations in diabetics are preceded by a foot ulcer¹¹
- 2/3 of all amputations are performed on diabetic patients⁷
- 50% of diabetic patients with an amputation have their other limb amputated within 5 yrs^{4,12-14}
- 30% of persons die within 4yrs of amputation⁴
- "Every 30 seconds, a limb is lost to diabetes somewhere in the world"¹²

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Foot Ulcer & Foot Exam⁴

- Research has shown that the development of a foot ulcer is preventable^{10,15}
- Annual foot exam prevalence among those with diabetes increased during 1995-2001;⁶
 - from 56.0-62.3%
 - This is still below the national target of 75%



Photo from: <http://search.proquest.com>

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Other conditions that lead to chronic, non-healing foot ulcers

- Arterial/venous ulcers
- Surgical complications
- Rheumatoid arthritis
- Congestive heart failure
- Lymphedema
- Other circulation compromising conditions

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Overview of Processes Leading to Lower Extremity Amputation

- Trauma-
 - Examples: War wounds, Occupational Wounds, Vehicular Accidents, Natural Disasters
 - **Explosion, Burn, Machinery/Tool/Equipment**
 - amputates or partially amputates limb.
 - **Surgery is generally required to/for**
 - manage neurovascular tissue
 - skin closure
 - muscle attachment
- ≈20-30% of all amputations⁴

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Overview of Processes Leading to Lower Extremity Amputation

- Cancer/Tumor-
 - Cancer or a tumor may present a structural weakness or a life-threatening, systemic condition if not removed. Excision may result in limb amputation of varying levels and severity.
- ≈5% of all amputations⁴

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Overview of Processes Leading to Lower Extremity Amputation

- Congenital Limb Deficiency or Absence-
 - An individual may be born with an incomplete or absent limb.
 - Surgery may be required to
 - remove a function inhibiting, vestigial limb
 - Provide a more "normal" residual limb so that "standard" prosthetic componentry may be used to enhance function
- <3% of all amputations
- Occurs in ≈1/2000 births⁴

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Upper Extremity:

"By far, the most typical patient with upper limb amputation is a young man who has sustained trauma..."^{15,16}



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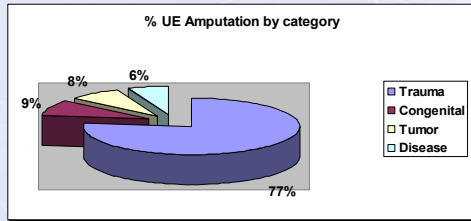
**Processes Leading to Upper Extremity Amputation¹⁷
(hierarchically arranged)**

1. Trauma
2. Congenital Deficiency
3. Tumor
4. Disease

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Processes Leading to Upper Extremity Amputation¹⁷

According to Davies et al:

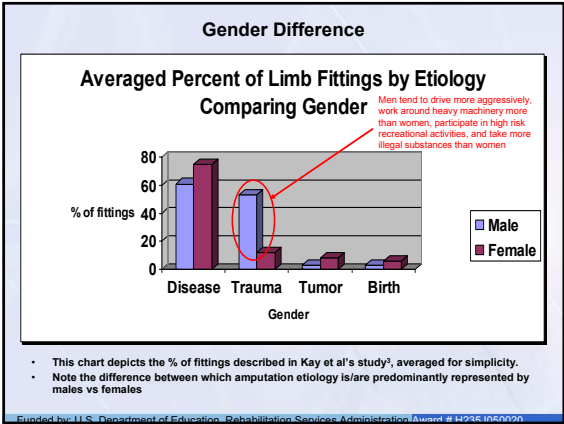


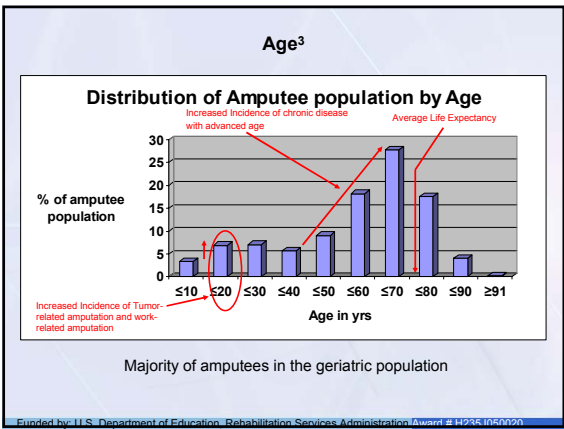
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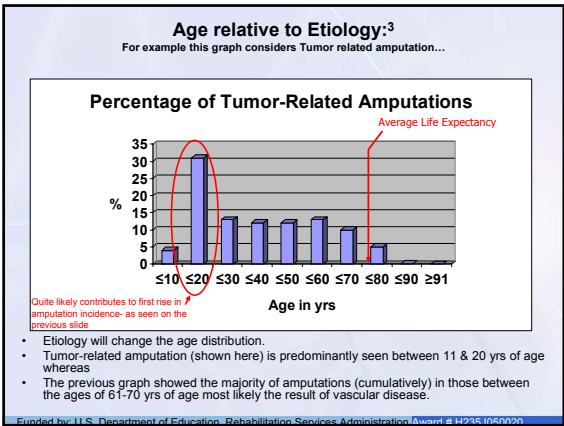
Other Considerations of Amputation (LE & UE)

- Gender
- Age
- Breakdown of Amputation by Level
- War
- Developed vs Developing Countries
- Frostbite
- Landmines

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Developed vs Developing Countries²²

% of Lower Extremity Amputation by Etiology			
Developed World Cause	%	Developing World Cause	%
Peripheral Vascular Disease (~25-50% have Diabetes)	85-90	Trauma	55-95
Trauma	9	Disease	10-35
Tumor	4	Tumor	5
Congenital	3	Congenital	4
Infection	1	Infection	11-35

% of Upper Extremity Amputation by Etiology			
Developed World Cause	%	Developing World Cause	%
Disease	30	Trauma	86
Trauma	29	Disease	6
Tumor	26	Congenital	6
Congenital	15	Tumor	1




- These figures account for the US AND FOREIGN countries (for "Developed") and therefore are different from some values presented earlier.
- Notice that Trauma (as opposed to disease) is the predominant cause of LE amputation in Developing Countries.

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Frostbite²²

- Statistics on Frostbite vary depending on the country
 - May be documented as its own entity
 - May be tracked as trauma
 - May be tracked as a vascular complication

- Typically occurs when one is trapped in extreme cold conditions for extended periods
 - Substance abuse could be a factor








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Land Mines^{22,23}

- In war torn countries, land mines account for 80% of amputations to civilians
- 60-70 million land mines in place in > 70 countries
- Land mines wound or kill someone every 22 minutes
 - Weekly: 1200 injured & 800 killed
- Life cost to clear 5000 mines: one de-miner killed + 2 injured
- 20 new mines are planted for every 1 removed
- Recent Example: War in Croatia (1991-92):
 - 2 million mines planted without mapping
- 2000-3000 experts must work for ≈ 10yrs to remove them

Photos from: <http://search.live.com/images/>

A. Landmine victim. B. Landmine. C. Cambodian Landmine awareness poster.

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