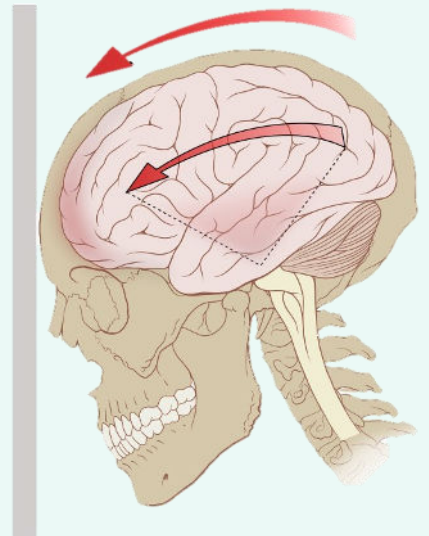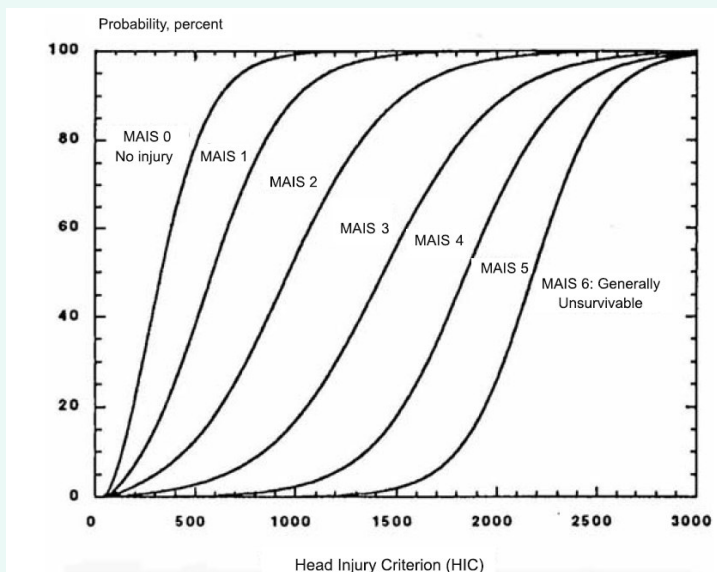# SAFE SYSTEM SYNOPSIS

Head Injury Criterion
HIC

The **Head Injury Criterion** (HIC) was developed in the 1970s by Wayne State University as a measurement of likelihood of head injury as a result of a head impact. It was developed based on human cadavers, human volunteers, animal cadavers, clinical research, and injury mechanisms. It is expressed by the formula[1]:

$$HIC = \max \left[\left\{ \frac{1}{t_2 - t_1} \right\} \int_1^2 a(t)\, dt \right]^{2.5}$$

t_1 & t_2 = initial and final time | a = resultant acceleration

HIC is calculated with two values: (a) the maximum acceleration and (b) the time over which this acceleration had occurred. HIC is expressed as either $HIC_{15,}$ or HIC_{36}. The former denotes that the maximum acceleration recorded over a period of 15 milliseconds was used in the calculation of HIC and the latter 36 milliseconds.

The sigmoidal graph below correlates HIC values and the probability of sustaining a head injury expressed in MAIS[2].

NOTE: The current EuroNCAP acceptable HIC score is 650 for vehicle crash testing.

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References
[1] Yoganandan, Narayan, Alan M. Nahum, and John W. Melvin, eds. Accidental injury: biomechanics and prevention. Springer, 2014.
[2] Mackay, M. (2007). The increasing importance of the biomechanics of impact trauma. Sadhana, 32(4), 397-408.