Preferred Symbols in *Clinical Pharmacokinetics*

The most frequently used symbols in clinical pharmacokinetics, as suggested in this list, have been adopted for use in articles in *Clinical Pharmacokinetics* as preferred pharmacokinetic and pharmacodynamic symbols, following consultation with the Editors and the Journal Editorial Board. Authors should use these symbols in manuscripts for submission to the journal, and the symbols should be defined at their first mention in the abstract, main text, tables and figures. However, in rare circumstances, exceptions to the suggested symbology can be considered. In that case, the request should be made by the authors in their letter of submission. These exemptions will then be considered by both the Editors and the Journal Reviewers.

Preferred Pharmacokinetic Symbols and Abbreviations		
Symbol	**Unit**	***Definition***
A	Amount	*Amount of drug in the body at any time*
A_a	Amount	*Amount of drug to be absorbed*
$A_{abs(t)}$	Amount	*Amount of drug absorbed until time t*
A_{ss}	Amount	*Amount of drug in the body at steady state*
$A_{av,ss}$	Amount	*Average amount of drug in the body at steady state*
A_{rem}	Amount	*Amount of drug remaining to be eliminated (excreted)*
$A_{m(t)}$	Amount	*Amount of metabolite in the body at a given time*
A_m	Amount	*Total amount of metabolite formed*
Ae	Amount	*Cumulative amount of unchanged drug excreted in urine*
Ae_∞	Amount	*Cumulative amount of unchanged drug excreted in urine from time zero to infinity after single dose*
Ae_t	Amount	*Cumulative amount of unchanged drug excreted in urine at a given time*
$Ae_{t1–t2}$	Amount	*Amount of unchanged drug excreted in urine within timespan t1 to t2*
Ae_τ	Amount	*Amount of unchanged drug excreted in urine during a dosage interval (τ) at steady state*
AUC	Amount • time/volume	*Area under the plasma concentration-time curve*[†]
AUC_∞	Amount • time/volume	*Area under the plasma concentration-time curve from time zero to infinity*
AUC_t	Amount • time/volume	*Area under the plasma concentration-time curve from time zero to time t* *Note: AUC_{24}, not $AUC_{0–24}$ or AUC_{24h}; however, if time periods >24 hours are used, these will have to be specified, e.g. if measured over 36 hours or 8 days or 3 weeks, AUC_{36h}, AUC_{8d} or AUC_{3wk}, respectively*
AUC_τ	Amount • time/volume	*Area under the plasma concentration-time curve during a dosage interval (τ)*
$AUC_{t1–t2}$	Amount • time/volume	*Area under the plasma concentration-time curve within timespan t1 to t2*

AUC_{last}	Amount • time/volume	*Area under the plasma concentration-time curve from time zero to the time of the last measurable concentration*
$\%AUC_{extrap}$	%	*Area under the plasma concentration-time curve extrapolated from time t to infinity as a percentage of the total AUC*
AUMC	Amount • $(time)^2$/volume	*Area under the first moment of the plasma concentration-time curve from time zero to infinity*
$AUMC_t$	Amount • $(time)^2$/volume	*Area under the first moment of the plasma concentration-time curve from time zero to time t*
$\%AUMC_{extrap}$	%	*Area under the first moment of the plasma concentration-time curve extrapolated from time t to infinity as a percentage of the total AUC*
C	Amount/volume	*Plasma drug concentration at any given time*[†]
C_0	Amount/volume	*Initial (fictive) or back-extrapolated plasma drug concentration at time zero following bolus intravenous injection*
$C_{av,ss}$	Amount/volume	*Average steady-state plasma drug concentration during multiple-dose administration*
C_{last}	Amount/volume	*Last measurable plasma drug concentration*
C_{max}	Amount/volume	*Maximum (peak) plasma drug concentration*
$C_{max,\ N}$	Amount/volume	*Maximum (peak) plasma drug concentration after regular administration of N doses*
$C_{max,ss}$	Amount/volume	*Maximum (peak) steady-state plasma drug concentration during a dosage interval*
C_{min}	Amount/volume	*Minimum plasma drug concentration*
$C_{min,eff}$	Amount/volume	*Minimum effective concentration of drug or metabolite*
$C_{min,N}$	Amount/volume	*Minimum plasma drug concentration after regular administration of N doses*
$C_{min,ss}$	Amount/volume	*Minimum steady-state plasma drug concentration during a dosage interval*
$C_{min,tox}$	Amount/volume	*Minimum toxic concentration of drug or metabolite*
C_n	Amount/volume	*Intercept of the initial residual line with the ordinate*
C_{ss}	Amount/volume	*Steady-state plasma drug concentration during constant-rate infusion*
C_t	Amount/volume	*Plasma drug concentration at a specified time t after administration of a given dose*
C_{trough}	Amount/volume	*Trough plasma concentration (measured concentration at the end of a dosing interval at steady state [taken directly before the next administration])*
C_z	Amount/volume	*Intercept of the slowest disposition slope with the ordinate*
CL	Volume/time or volume/time/kg	*Apparent total body clearance of drug from plasma*
CL/F	Volume/time or volume/time/kg	*Apparent total body clearance of drug from plasma after oral administration*
CL_{CR}	Volume/time or volume/time/kg	*Creatinine clearance*

CL_f	Volume/time or volume/time/kg	*Formation clearance of drug to metabolite*
CL_H	Volume/time or volume/time/kg	*Hepatic clearance of drug from plasma*
CL_{int}	Volume/time or volume/time/kg	*Intrinsic clearance of drug from plasma by the liver devoid of the influence of blood flow or protein binding*
CL_m	Volume/time or volume/time/kg	*Apparent total body clearance of metabolite from plasma*
CL_{NR}	Volume/time or volume/time/kg	*Nonrenal clearance of drug from plasma*
CL_R	Volume/time or volume/time/kg	*Renal clearance of drug from plasma*
D	Amount	*Dose*
E	–	*Organ extraction ratio (specify by organ, according to the symbol qualifiers listed in the 'Symbol Qualifiers' table)*
F	% or fraction	*Bioavailability (systemic availability of the administered dose)*
F_{max}	% or fraction	*Maximum bioavailability*
F_{rel}	% or fraction	*Relative bioavailability*
f_b	Fraction	*Fraction of bound drug*
f_e	Fraction	*Fraction of intravenously administered drug excreted in urine*
f_e/F	Fraction	*Fraction of non-intravenously administered drug excreted in urine*
f_m	Fraction	*Fraction of drug metabolized*
f_{NR}	Fraction	*Fraction of drug cleared nonrenally*
f_R	Fraction	*Fraction of drug cleared renally*
f_{rel}	Fraction	*Fraction of the administered dose in comparison with a standard*
f_{rem}	Fraction	*Fraction of drug remaining to be eliminated*
f_u	Fraction	*Fraction of unbound drug in plasma*
k	$Time^{-1}$	*First-order rate constant*
k_0	$Time^{-1}$	*Zero-order rate constant*
k_{12}	$Time^{-1}$	*Transfer rate constant (first-order) from the central compartment (1) to the peripheral compartment (2)*
k_{21}	$Time^{-1}$	*Transfer rate constant (first-order) from the peripheral compartment (2) to the central compartment (1)*
k_a	$Time^{-1}$	*Absorption rate constant (first-order)*
k_e	$Time^{-1}$	*Elimination rate constant from the central compartment*
k_{eq}	$Time^{-1}$	*Equilibrium rate constant*
k_f	$Time^{-1}$	*Formation rate constant*
k_{ij}	$Time^{-1}$	*Transfer rate constant (first-order) from compartment i to compartment j*
k_R	Amount/volume	*Dissociation constant of drug-receptor complex*

Km	Amount/volume	*Michaelis-Menten constant*
K_p	–	*Equilibrium distribution ratio of a substance between a tissue and blood, or partition coefficient*
λ	$Time^{-1}$	*Elimination rate constant of drug*
λ_1	$Time^{-1}$	*Initial disposition rate constant*
λ_i	$Time^{-1}$	*Exponent of the ith exponential term of a polyexponential equation*
λ_z	$Time^{-1}$	*Terminal disposition rate constant/terminal rate constant*
LD	Amount (amount/weight)	*Loading dose*
LLQ	Amount/volume	*Lower limit of quantification*
MAT	Time	*Mean absorption time*
MD	Amount (amount/weight)	*Maintenance dose*
MDT	Time	*Mean dissolution time*
MR	–	*Metabolic ratio (of the metabolite AUC and the parent drug AUC)*
MRT	Time	*Mean residence time*
pKa	–	*Acid dissociation constant*
P	Volume/time	*Permeability constant*
PTF%	%	*Peak trough fluctuation over one dosing interval at steady state*
Q	Volume/time	*Fluid flow/intercompartmental clearance*
Q_i	Volume/time	*Intercompartmental clearance between the central compartment and compartment i*
R_0	Amount/time	*Constant infusion rate (zero order)*
R_{ac}	–	*Accumulation ratio*
$R_{ac(AUC)}$	–	*Accumulation ratio calculated from the $AUC_{\tau,ss}$ and AUC_{τ} after single dosing*
$R_{ac(Cmax)}$	–	*Accumulation ratio calculated from the $C_{max,ss}$ and C_{max} after single dosing*
$R_{ac(Cmin)}$	–	*Accumulation ratio calculated from the $C_{min,ss}$ and from the concentration at $t = \tau$ after single dosing*
t	Time	*Time after drug administration*
$\bar{t}$	Time	*Transit time*
t_{k0}	Time	*Duration of a zero-order input process (e.g. infusion time)*
t_{lag}	Time	*Lag time*
t_{max}	Time	*Time to reach the maximum (peak) plasma concentration following drug administration*
$t_{max,ss}$	Time	*Time to reach the maximum (peak) plasma concentration following drug administration at steady state*
t_{mid}	Time	*Midpoint time of a collection interval*
t_t	Time	*Turnover time*

$t_{½}$	Time	*Elimination half-life (to be used in a one-compartment or non-compartmental model)*
$t_{½\alpha}$	Time	*Initial or disposition half-life*
$t_{½\beta}$	Time	*Terminal elimination half-life (to be used in a two-compartment model)*
$t_{½\gamma}$	Time	*Terminal or elimination half-life (to be used in a three-compartment model)*
$t_{½\lambda i}$	Time	*Half-life associated with the ith exponent of a polyexponential equation*
$t_{½abs}$	Time	*Absorption half-life*
τ	Time	*Dosage interval*
$T>50\% C_{max}$	Time	*Time interval during which the plasma drug concentration exceeds 50% of the C_{max}*
$T>C_{av,ss}$	Time	*Time interval during which the plasma drug concentration exceeds the $C_{av,ss}$*
$T>C_{max,ss}$	Time	*Time interval during which the plasma drug concentration exceeds the $C_{max,ss}$*
T>MIC	Time	*Time interval during which the plasma drug concentration exceeds the MIC*
$T>C_{min,ss}$	Time	*Time interval during which the plasma drug concentration exceeds the $C_{min,ss}$*
ULQ	Amount/volume	*Upper limit of quantification*
V_{ur}	Volume	*Volume of urine excreted*
V_1	Volume or volume/kg	*Apparent volume of the central or plasma compartment in a two-compartment model*
V_2	Volume or volume/kg	*Apparent volume of the peripheral compartment in a two-compartment model*
V_d	Volume or volume/kg	*Apparent volume of distribution*
V_d/F	Volume or volume/kg	*Apparent volume of distribution after non-intravenous administration*
V_{max}	Amount/time	*Maximum rate (of metabolism or any reaction)*
V_{ss}	Volume or volume/kg	*Apparent volume of distribution at steady state*
V_{ss}/F	Volume or volume/kg	*Apparent volume of distribution at steady state after non-intravenous administration*
V_z	Volume or volume/kg	*Apparent volume of distribution during the terminal phase*[††]
V_z/F	Volume or volume/kg	*Apparent volume of distribution during the terminal phase after non-intravenous administration*

† For body fluids other than plasma, use the symbol qualifiers listed in the 'Symbol Qualifiers' table, e.g. drug concentration in blood: C_b; drug concentration in serum: C_s; minimum drug concentration in blood at steady state: $C_{min,ss(b)}$; minimum drug concentration in serum at steady state: $C_{min,ss(s)}$, etc.

†† Preferred symbol rather than $V_{d\beta}$ or V_d area.

Symbol Qualifiers					
Sites of measurement (to qualify C, CL, AUC, V, etc.)		**Organs and elimination routes (to qualify CL, k, A, f, etc.)**		**Routes of administration (to qualify D, LD, MD, AUC, etc.)**	
a	Arterial	e	Excreted in urine	bu	Buccal
b	Blood	H	Hepatic	im	Intramuscular
bc	Blood cells	m	Metabolite	ip	Intraperitoneal
bil	Bile	NR	Nonrenal	iv	Intravenous
dial	Dialysis	R	Renal	ns	Nasal
ec	Extracellular			oral	Oral
ev	Extravascular			po	By mouth (per os)
G	Gastric			pr	Per rectum
GI	Gastrointestinal			pul	Pulmonary
int	Intrinsic			rec	Rectal
p	Plasma			sc	Subcutaneous
s	Serum			sl	Sublingual
sal	Saliva			td	Transdermal
tiss	Tissue			top	Topical
u	Unbound				
ur	Urine				
v	Venous				

Preferred Ligand Binding, Receptor and Pharmacodynamic Symbols		
Symbol	**Unit**	**Definition**
AUEC	Arbitrary units • time	Area under the effect curve
B	Amount/volume	Concentration of bound ligand
B_{max}	Amount/volume	Maximum amount bound
C_e	Amount/volume	Fictive concentration in the effect compartment
C_1	Amount/volume	Drug concentration in the central compartment
E	(Effect unit)	Measured or observed effect
E_0	(Effect unit)	Baseline effect
E_{max}	(Effect unit)	Maximum effect
EC_{50}	Amount/volume	Concentration of drug producing 50% of the maximum effect
[I]	Amount/volume	Concentration of the inhibitor
IC_{50}	Amount/volume	Concentration of drug producing 50% inhibition
I_{max}	(Effect unit)	Maximum inhibition
k_α	$Time^{-1}$	Rate constant for receptor activation
k_β	$Time^{-1}$	Rate constant for receptor deactivation
K_A	Amount/volume	Association constant (k_{on}/k_{off})
K_D	Amount/volume	Dissociation constant (k_{off}/k_{on})
k_{in}	(Effect unit) ($time^{-1}$)	Zero-order constant for input or production response
k_{off}	$Time^{-1}$	Dissociation rate constant
k_{on}	Amount/volume • $time^{-1}$	Association rate constant
k_{out}	$Time^{-1}$	First-order rate constant for loss of response
k_{eq}	$Time^{-1}$	Equilibrium rate constant
k_{e0}	$Time^{-1}$	Equilibrium rate constant between plasma and the effect compartment
K_{eq}	Amount/volume	Equilibrium constant
K_i	Amount/volume	Inhibition constant
$K_{i,c}$	Amount/volume	Inhibition constant for competitive inhibition
[L]	Amount/volume	Concentration of ligand available for binding
[LR]	Amount/volume	Concentration of ligand-receptor complexes
$[LR]_{eq}$	Amount/volume	Concentration of ligand-receptor complexes at equilibrium
MEC	Amount/volume	Minimum effective concentration
MIC	Amount/volume	Minimum inhibitory concentration
[R]	Amount/volume	Concentration of a receptor available for binding a ligand
$[R_T]$	Amount/volume	Total concentration of a receptor available for binding a ligand
S	(Effect unit)/(amount/volume)	Slope of the line relating the effect to the concentration
$t_{½diss}$	Time	Half-life of dissociation
$t_{½eq}$	Time	Equilibrium half-life
T_{dur}	Time	Duration of effective pharmacological response
t_{MEC}	Time	Duration of the minimum (or optimum) effective concentration
V_e	Volume	Fictive volume of the effect compartment