Mode 1 (on-treatment) flow₁:

$$\frac{dx}{dt} = \left(\alpha_x \left(k_1 + \frac{(1 - k_1)z}{z + k_2}\right) - \beta_x \left(k_3 + \frac{(1 - k_3)z}{z + k_4}\right) - m_1 \left(1 - \frac{z}{z_0}\right)\right) x$$

$$\frac{dy}{dt} = m_1 \left(1 - \frac{z}{z_0} \right) x + \left(\alpha_y \left(1 - d \frac{z}{z_0} \right) - \beta_y \right) y$$

$$\frac{dz}{dt} = \frac{-z}{\tau}$$

$$\frac{dv}{dt} = \left(\alpha_x \left(k_1 + \frac{(1 - k_1)z}{z + k_2}\right) - \beta_x \left(k_3 + \frac{(1 - k_3)z}{z + k_4}\right) - m_1 \left(1 - \frac{z}{z_0}\right)\right) x + m_1 \left(1 - \frac{z}{z_0}\right) x + \left(\alpha_y \left(1 - d\frac{z}{z_0}\right) - \beta_y\right) y$$

$$\operatorname{jump}_{1\to 2}:$$

$$x+y \le r_0 \wedge \frac{dx}{dt} + \frac{dy}{dt} < 0$$

jump_{2→1}:

$$x + y \ge r_1 \land \frac{dx}{dt} + \frac{dy}{dt} > 0$$

 $+ m_1 \left(1 - \frac{z}{z_0}\right) x + \left(\alpha_y \left(1 - d\frac{z}{z_0}\right) - \beta_y\right) y$

$$\frac{dx}{dt} = \left(\alpha_x \left(k_1 + \frac{(1 - k_1)z}{z + k_2}\right) - \beta_x \left(k_3 + \frac{(1 - k_3)z}{z + k_4}\right) - m_1 \left(1 - \frac{z}{z_0}\right)\right) x$$

$$\frac{dy}{dt} = m_1 \left(1 - \frac{z}{z_0}\right) x + \left(\alpha_y \left(1 - d\frac{z}{z_0}\right) - \beta_y\right) y$$

$$\frac{dx}{dt} = \left(\alpha_x \left| k_1 + \frac{(z - k_1)z}{z + k_2} \right| \right)$$

$$\frac{dy}{dt} = m_1 \left(1 - \frac{z}{z_0}\right) x + \left(\alpha_y \left| \frac{dz}{dt} \right| \right)$$

$$\frac{dz}{dt} = \frac{z_0 - z}{\tau}$$

$$\frac{dz}{dt} = \frac{(z - z)z}{\tau}$$

$$P_{x}\left(k_{3} + \frac{z}{z + k_{4}}\right) - m_{1}\left(1 - \frac{z}{z_{0}}\right)$$

$$P_{y}\left(1 - d\frac{z}{z_{0}}\right) - \beta_{y}y$$

$$\left(1-d\frac{z}{z_0}\right)-\beta_y\bigg)y$$

$$\frac{dv}{dt} = \frac{\sigma}{\tau}$$

$$\frac{dv}{dt} = \left(\alpha_x \left(k_1 + \frac{(1 - k_1)z}{z + k_2}\right) - \beta_x \left(k_3 + \frac{(1 - k_3)z}{z + k_4}\right) - m_1 \left(1 - \frac{z}{z_0}\right)\right) x$$