Online Appendix

Proof of Lemma 1: Applying the first-order condition (FOC) to the provider's objective function gives $\tau_i^* = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$, which is independent of patients' risk distribution $F_i(r)$. This function is concave at τ_i^* if and only if $\frac{d^2 g_i(.)}{d\,\tau_i^2} < 0 \Leftrightarrow 0 \leq b_{ti} < \frac{\alpha h+b_{ni}}{k}$; otherwise, τ_i^* is the minimum and the provider would either use or don't use advanced treatment without ordering the test (i.e., $\tau_i^* \in \{0,1\}$). $\tau_i^* = \hat{\tau}$ follows from the proof of the Proposition 1. □

Proof of Lemma 2: Since $r \in [0,1]$, we focus on $0 < \hat{\tau} < 1 \Leftrightarrow 0 \leq z < \bar{z} \Leftrightarrow 0 \leq c < \bar{c}$ where $\hat{\tau} = \frac{z+c}{(1+\alpha)h+(1-k)(\lambda_s-\lambda_r)}$. □

Proof of Proposition 1: Applying the extended revelation principle to program (5), we restrict our attention to direct mechanisms where the contracts are a pair of optimal treatment choices for the two patient types (i.e., $[\boldsymbol{\zeta_L}, \tau_L, x_L]$ and $[\boldsymbol{\zeta_H}, \tau_H, x_H]$). Because treating high-risk patients has relatively higher risk, the payer needs higher-valued contract payment terms to ensure the provider's participation ($IRH \geq 0$) – compared to the case where patients are low-risk. Thus, we omit the ICH constraint and check if it holds after designing optimal contracts. Furthermore, the provider has incentive to misrepresent low-risk patients, so IRL always holds. We prove this conjecture by showing that $IRL > 0$ given the payment contracts. Thus, omitting ICH and IRL, in the equilibrium IRH and ICL has to bind for all treatment choices. We solve the payer's constrained maximization problem for the nine treatment choices given in Table A1. Note that the provider may choose to change the treatment choice when misrepresenting a patient (c.f. ICL and ICH). Following Lemma 1 we know that the optimal treatment threshold decision of the provider does not depend on the patient risk (i.e., $\tau_i^* = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$) but does depend on payment terms. Therefore, if the provider misrepresents his patient and chooses a contract that is designed for other patient type, then the optimal treatment threshold will also change for the patient because of the change in contract terms. For example, when treatment Option 2 is selected for both patient types (i.e., $\{x_i^*, \tau_i^*\} = \{1, \tau_i^*\}$) the payer's problem is:

$$\max_{\boldsymbol{\zeta_L}, \boldsymbol{\zeta_H}, \tau_L, \tau_H} V = \sum_{i \in \{L,H\}} \beta_i v_i(\boldsymbol{\zeta_i}, 1, \tau_i)$$

$$s.t.\ \tau_i^* = \underset{0 \le \tau_i \le 1}{argmax}\ g_i(1, \tau_i | \boldsymbol{\zeta_i}) \qquad (OTC)$$

$$(w_L - c)\left(\int_{\tau_L^*}^1 f_L(y)dy\right) + b_{tL}\left(\int_{\tau_L^*}^1 (1-ky) f_L(y)dy\right) + b_{nL}\left(\int_0^{\tau_L^*} (1-y) f_L(y)dy\right) - \alpha h\left(\int_0^{\tau_L^*} y f_L(y)dy\right)$$
$$= (w_H - c)\left(\int_{\tau_H^*}^1 f_L(y)dy\right) + b_{tH}\left(\int_{\tau_H^*}^1 (1-ky) f_L(y)dy\right) + b_{nH}\left(\int_0^{\tau_H^*} (1-y) f_L(y)dy\right) - \alpha h\left(\int_0^{\tau_H^*} y f_L(y)dy\right) \qquad (ICL)$$

$$(w_H - c)\left(\int_{\tau_H^*}^1 f_H(y)dy\right) + b_{tH}\left(\int_{\tau_H^*}^1 (1-ky) f_H(y)dy\right) + b_{nH}\left(\int_0^{\tau_H^*} (1-y) f_H(y)dy\right) - \alpha h\left(\int_0^{\tau_H^*} y f_H(y)dy\right) = 0 \qquad (IRH)$$

Payer's problem for other treatment choices can be presented similarly. When the test is ordered, the payer's value function can either be concave or convex in threshold level, so the optimal treatment threshold might be an interior point or an extreme point. Note that if FOC gives a minimum ($\frac{d^2\, V(.)}{d\, \tau_i^2} > 0$) then the underlying treatment choice will be dominated by other treatment choices that consider the extreme points (i.e., $\tau_i^* = 0$ or $\tau_i^* = 1$). Thus, if the test is ordered $\frac{d\, V(.)}{d\, \tau_i} = 0 \Leftrightarrow \tau_i = \frac{w_i + b_{ti} - b_{ni} + z}{h + kb_{ti} - b_{ni} + (1-k)(\lambda_s - \lambda_r)}$. From Lemma 1 the payer knows the best response function of the provider for optimal treatment threshold of each patient type. Therefore, the payer would choose payment terms such that the provider's best response (i.e., $\tau_i^* = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$) results in payer's optimal treatment threshold.

From ICL, IRH and $\frac{w_i+b_{ti}-b_{ni}+z}{h+kb_{ti}-b_{ni}+(1-k)(\lambda_s-\lambda_r)} = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$, we get $\boldsymbol{\zeta_L} = \{w_L(b_{ti}), b_{nL}(b_{ti}), b_{tL}\}$ and $\boldsymbol{\zeta_H} = \{w_H(b_{ti}), b_{nH}(b_{ti}), b_{tH}\}$. Replacing the payment terms in the provider's optimal treatment threshold we get $\tau_i^* = \hat{\tau}$ for all treatment choices with $x_i^* \neq 0$. Thus, regardless of the slack variables (e.g., b_{ti}), the provider would choose the same treatment threshold for both patient types. The payer would choose the remaining two terms to maximize its value function. Replacing payment terms into payer's value function, we show that when the test is used for both patient types (i.e., $\{x_i^*, \tau_i^*\} = \{1, \tau_i^*\}$), while the value function is independent of changes in b_{tL} (i.e., $\frac{d\,V(.)}{d\,b_{tL}} = 0$), it is always decreasing in b_{tH} (i.e., $\frac{d\,V(.)}{d\,b_{tH}} < 0$); therefore, $b_{tH} = 0$. we have: $w_H = \Big(\Big(c \int_{\hat{\tau}}^{1} f_H(y)\,dy + \alpha h \int_0^{\hat{\tau}} y f_H(y)\,dy\Big)\big(z + c - (1+\alpha)h - (1-k)(\lambda_s - \lambda_r)\big) + \Big(\int_0^{\hat{\tau}} f_H(y)\,dy - \int_0^{\hat{\tau}} y f_H(y)\,dy\Big)\big(\alpha h z - c(1-k)(\lambda_s - \lambda_r)\big)\Big) / \Big((z+c)\int_{\hat{\tau}}^{1} f_H(y)\,dy - \Big(1 - \int_0^{\hat{\tau}} y f_H(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\big)\Big)$, $b_{nH} = \Big((z+c)\alpha h \int_{\hat{\tau}}^{1} f_H(y)\,dy + \alpha h \Big(\int_0^{\hat{\tau}} y f_H(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\big)\Big) / \Big(\Big(1 - \int_0^{\hat{\tau}} y f_H(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\big) - (z+c)\int_{\hat{\tau}}^{1} f_H(y)\,dy\Big)$, $w_L = w_H - \psi\, b_{tL}$ and $b_{nL} = b_{nH} + \varphi\, b_{tL}$, where $\psi = \Big(\Big(\int_0^{\hat{\tau}} f_L(y)\,dy - \int_0^{\hat{\tau}} y f_L(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r) - (z+c)k\big) + \Big(\int_{\hat{\tau}}^{1} f_L(y)\,dy - k\int_{\hat{\tau}}^{1} y f_L(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r) - (z+c)\big)\Big) / \Big(\Big(1 - \int_0^{\hat{\tau}} y f_L(y)\,dy\Big)\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\big) - (z+c)\int_{\hat{\tau}}^{1} f_L(y)\,dy\Big)$ and $\varphi = \Big(k\big((1+\alpha)h + (1-k)(\lambda_s -$

$\lambda_r)) \left(\int_{\hat{\tau}}^{1} y f_L(y)\, dy\right) - k(z+c) \int_{\hat{\tau}}^{1} f_L(y)\, dy\Big) / \Big(\left(1 - \int_0^{\hat{\tau}} y f_L(y)\, dy\right) ((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)) - (z+c) \int_{\hat{\tau}}^{1} f_L(y)\, dy\Big)$. It can be shown that $\psi > 0$ and $\varphi > 0$ when $z < \bar{z}$, $c < \bar{c}$, $\int_0^{\hat{\tau}} f_L(y)\, dy > \int_0^{\hat{\tau}} y f_L(y)\, dy$ and $\int_{\hat{\tau}}^{1} f_L(y)\, dy > \int_{\hat{\tau}}^{1} y f_L(y)\, dy$.

Payment terms for the other treatment choices are derived using a similar approach. (The payment terms for the 5 equilibrium cases are presented Table A2.) Next, we check if IRL and ICH hold for all nine treatment choices. We show that when the provider treats high-risk patients with advanced treatment (i.e., $\tau_H^* = 0$) then $IRL = 0$. Otherwise,

$IRL = \alpha h \Big((z+c) \Big(\left(\int_{\hat{\tau}}^{1} f_H(y)\, dy\right) \int_0^{\hat{\tau}} f_L(y)\, dy - \left(\int_0^{\hat{\tau}} f_H(y)\, dy\right) \int_{\hat{\tau}}^{1} f_L(y)\, dy \Big) + \left(\int_0^{\hat{\tau}} y f_H(y)\, dy - \int_0^{\hat{\tau}} y f_L(y)\, dy\right) ((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)) \Big) / \Big(\left(1 - \int_0^{\hat{\tau}} y f_H(y)\, dy\right) ((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)) - (z+c) \int_{\hat{\tau}}^{1} f_H(y)\, dy\Big) > 0$. Using integration by parts we have: $\int_0^{\hat{\tau}} y f_H(y)\, dy = [y\, F_H(y)]_0^{\hat{\tau}} - \int_0^{\hat{\tau}} F_H(y)\, dy = \hat{\tau}\, F_H(\hat{\tau}) - \int_0^{\hat{\tau}} F_H(y)\, dy$. This can be replicated for the risk distribution of low-risk patients, so we get $IRL = \Gamma(\hat{\tau}) = \alpha h \frac{\int_0^{\hat{\tau}} F_L(y)\, dy - \int_0^{\hat{\tau}} F_H(y)\, dy}{1 - \tau + \int_0^{\hat{\tau}} F_H(y)\, dy}$. $\Gamma(\hat{\tau}) > 0$ because $F_L(y) \geq F_H(y)$ and $1 - \tau + \int_0^{\hat{\tau}} F_H(y)\, dy > 0$ because $0 \leq \hat{\tau} \leq 1$. Similar logic can be used to show $ICH > 0$.

To find the equilibrium treatment decisions, we examine the conditions for $\max[V(0), V(1)] > V(\hat{\tau})$ such that the payer would skip the test. Proposition 1 illustrates the equilibrium solution resulted from the comparison of the outcomes from all treatment choices. □

Proof of Corollary 1: Cases 1, 2, and 3 correspond to treatment choices with $\tau_H^* = 0$, where $IRL = 0$. Case 4 and 5 correspond to treatment choices with $\tau_H^* \neq 0$, where $IRL = \Gamma(\hat{\tau})$, and $\hat{\tau} = 1$ in case 5. □

Proof of Corollary 2: The maximum value for $\bar{B}_L$ and $\bar{B}_H$ is at $\hat{\tau}_L = E[r_L]$ and $\hat{\tau}_H = \frac{E[\mathrm{r}_H]}{1-\frac{\beta}{1-\beta}\frac{\Gamma(1)}{z+c}}$ respectively. $\bar{B}_L|_{\hat{\tau}=\hat{\tau}_L} > \bar{B}_H|_{\hat{\tau}=\hat{\tau}_H}$ because $\int_0^{\hat{\tau}} F_L(y)\,dy \geq \int_0^{\hat{\tau}} F_H(y)\,dy$ and $\frac{\beta}{1-\beta}\frac{\hat{\tau}}{z+c}\Gamma(\hat{\tau}) > 0$. □

Proof of Corollary 3: Corollary 3 is a direct result of the Table A2. □

Proof of Corollary 4: Corollary 4 is a direct result of the Proposition 1. □

Derivation for decentralized system with full information: The payer offers a type specific contract to the provider and extracts the entire provider surplus. $g_i(.)$ and $v_i(.)$ are the same as in Equations (3) and (4). The optimization problem for each patient type is:

$$\max_{\boldsymbol{\zeta_i}} \hat{V}_i = v_i(\boldsymbol{\zeta_i}, x_i, \tau_i) \qquad for\ \ i \in \{L, H\}$$

$$\text{s.t. } \{x_i^*, \tau_i^*\} = \underset{\substack{x_i \in \{0,1\} \\ 0 \leq \tau_i \leq 1}}{argmax}\, g_i(x_i, \tau_i | \boldsymbol{\zeta_i})$$

$$g_i(x_i, \tau_i) \geq 0$$

The treatment threshold is $\tau_i^* = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$ (cf. Lemma 1). The payer's optimization problem is to satisfy the following two conditions for each of the three options: Conditions 1A) ensures that the provider's best response (i.e., $\tau_i^* = \frac{c+b_{ni}-b_{ti}-w_i}{\alpha h+b_{ni}-kb_{ti}}$) results in payer's optimal treatment threshold, $w_i\big((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\big) + b_{ti}\big((1+\alpha)h - (z+c)k + (1-k)(\lambda_s - \lambda_r)\big) + b_{ni}\big(z + c - (1+\alpha)h - (1-k)(\lambda_s - \lambda_r)\big) + \alpha hz - ch - c(1-k)(\lambda_s - \lambda_r) = 0$; Conditions 1B) is the individual-rationality constraint, $(w_i - c)\int_{\tau_i^*}^{1} f_i(y)dy + b_{ti}\int_{\tau_i^*}^{1}(1-ky)f_i(y)dy + b_{ni}\int_0^{\tau_i^*}(1-y)f_i(y)dy - \alpha h\int_0^{\tau_i^*} y\, f_i(y)dy = 0$.

Conditions 1A and 1B give the payment contracts for each option as well as the $\hat{\tau}$ that maximizes social welfare when $x_i = 1$. When $x_i = 0$, then, the provider should treat patients with advanced treatment if and only if, $\hat{V}_i(\hat{\tau} = 0) > \hat{V}_i(\hat{\tau} = 1) \Leftrightarrow \int_0^1 y f_i(y)\, dy > \frac{z+c}{(1+\alpha)h+(1-k)(\lambda_s-\lambda_r)} \Leftrightarrow E[r_i] > \hat{\tau}$. The payer compares social welfare $\hat{V}_i(\hat{\tau})$ when $x_i = 1$ with $\max\left[\hat{V}_i(\hat{\tau} = 0), \hat{V}_i(\hat{\tau} = 1)\right]$ when $x_i = 0$. Then $\max\left[\hat{V}_i(\hat{\tau} = 0), \hat{V}_i(\hat{\tau} = 1)\right] > \hat{V}_i(\hat{\tau}) \Leftrightarrow B > \hat{B}_i = \frac{z+c}{\hat{\tau}}\left\{\int_0^{\hat{\tau}} F_i(y)\, dy + \min(0, E[r_i] - \hat{\tau})\right\}$. □

Proof of Proposition 2: The payer's value function under case 4 is $V = \lambda_s + (1-\beta)\left(-k\left(\int_0^1 y f_H(y)\, dy\right)(\lambda_s - \lambda_r) - (z+c)\int_{\hat{\tau}}^1 f_H(y)\, dy - \left(\int_0^{\hat{\tau}} y f_H(y)\, dy\right)\left((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\right) - B\right) + \beta\left(-\left(\int_0^1 y f_L(y)\, dy\right)(h(1+\alpha) + \lambda_s - \lambda_r) - \Gamma(\hat{\tau})\right)$. Using implicit function theorem, we have

$$\frac{d\, V(.)}{d\, \alpha} > 0 \Leftrightarrow E[r_L] \leq \frac{\alpha h \hat{\tau}^2 (F_L(\hat{\tau})\Omega_H - F_H(\hat{\tau})\Omega_L) - \left((z+c)\Omega_H - \alpha h \hat{\tau}^2\right)(\Omega_L - \Omega_H)}{(z+c){\Omega_H}^2} - \frac{(1-\beta)(\int_0^{\hat{\tau}} y f_H(y)\, dy)}{\beta}.$$

We find the necessary conditions for Proposition 2.a. by including the optimality conditions of case 4 from Proposition 1. Similar approach can be used for Proposition 2.b. □

Proof of Proposition 3: The proof is similar to the logic presented in Proposition 2. □

Proof of Lemma 3 and Proposition 4: Program (12) can be solved similar to the system with full information where the payer offers a type specific contract to the provider and extracts the entire provider surplus. The payer's value function is independent of changes in b_t when

$$w = \frac{\left(\int_0^{\hat{\tau}} yf(y)\,dy - \int_0^{\hat{\tau}} f(y)\,dy\right)\left(h(c-z\alpha)+c(1-k)(\lambda_s-\lambda_r)\right)+\left(c\int_{\hat{\tau}}^1 f(y)\,dy + h\alpha\int_0^{\hat{\tau}} yf(y)\,dy\right)\left(z+c-h(1+\alpha)-(1-k)(\lambda_s-\lambda_r)\right)}{(z+c)\int_{\hat{\tau}}^1 f(y)\,dy-\left(1-\int_0^{\hat{\tau}} yf(y)\,dy\right)\left((1+\alpha)h+(1-k)(\lambda_s-\lambda_r)\right)};$$

$$b_n = \frac{h\alpha\left((z+c)\int_{\hat{\tau}}^1 f(y)\,dy+\left(\int_0^{\hat{\tau}} yf(y)\,dy\right)\left((1+\alpha)h+(1-k)(\lambda_s-\lambda_r)\right)\right)}{\left(1-\int_0^{\hat{\tau}} yf(y)\,dy\right)\left((1+\alpha)h+(1-k)(\lambda_s-\lambda_r)\right)-(z+c)\int_{\hat{\tau}}^1 f(y)\,dy}.$$

The ex-ante outcome of the payer when the test is compulsory is:

$$V^{com} = \beta\left(\lambda_s\int_0^{\hat{\tau}} f_L(y)\,dy - \left((1+\alpha)h+\lambda_s-\lambda_r\right)\int_0^{\hat{\tau}} yf_L(y)\,dy - (z+c-\lambda_s)\int_{\hat{\tau}}^1 f_L(y)\,dy - k(\lambda_s-\lambda_r)\int_{\hat{\tau}}^1 yf_L(y)\,dy\right) + (1-\beta)\left(\lambda_s\int_0^{\hat{\tau}} f_H(y)\,dy - \left((1+\alpha)h+\lambda_s-\lambda_r\right)\int_0^{\hat{\tau}} yf_H(y)\,dy - (z+c-\lambda_s)\int_{\hat{\tau}}^1 f_H(y)\,dy - k(\lambda_s-\lambda_r)\int_{\hat{\tau}}^1 yf_H(y)\,dy\right) - B - C_V$$

In order to find when it is optimal to make the test compulsory, we examine the conditions for $V^{com}(\hat{\tau}) > \max[V(0), V(1), V(\hat{\tau})]$ such that social welfare is higher when the test is compulsory. Lemma 3 illustrates the region where compulsory testing is optimal when $C_V = 0$. □

Proof of Corollary 5: The maximum value for the function $\bar{B}^{com}$ is at $\hat{\tau}_H$. □

Table A1: Optimization problem for 9 subgames

		Type-L		
	Treatment choice	$\{x_L^*, \tau_L^*\} = \{0{,}0\}$ (Option 0)	$\{x_L^*, \tau_L^*\} = \{0{,}1\}$ (Option 1)	$\{x_L^*, \tau_L^*\} = \{1, \tau_L^*\}$ (Option 2)
Type-H	$\{x_H^*, \tau_H^*\} = \{0{,}0\}$ (Option 0)	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 0) + \beta_H v_H(\boldsymbol{\zeta_H}, 0, 0)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 1) + \beta_H v_H(\boldsymbol{\zeta_H}, 0, 0)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 1, \tau_L^*) + \beta_H v_H(\boldsymbol{\zeta_H}, 0, 0)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*
	$\{x_H^*, \tau_H^*\} = \{0{,}1\}$ (Option 1)	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 0) + \beta_H v_H(\boldsymbol{\zeta_H}, 0{,}1)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 1) + \beta_H v_H(\boldsymbol{\zeta_H}, 0{,}1)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 1, \tau_L^*) + \beta_H v_H(\boldsymbol{\zeta_H}, 0{,}1)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*
	$\{x_H^*, \tau_H^*\} = \{1, \tau_H^*\}$ (Option 2)	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 0) + \beta_H v_H(\boldsymbol{\zeta_H}, 1, \tau_H^*)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 0, 1) + \beta_H v_H(\boldsymbol{\zeta_H}, 1, \tau_H^*)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*	$\max_{\zeta_L,\zeta_H} \beta_L v_L(\boldsymbol{\zeta_L}, 1, \tau_L^*) + \beta_H v_H(\boldsymbol{\zeta_H}, 1, \tau_H^*)$ s.t. *OTC*, *ICH*, *ICL*, *IRH*, *IRL*

Table A2: Payment contracts

Equilibrium Region	Type	Contract
Case 1 L: Advanced treatment H: Advanced treatment	Type-L	$w_L = c - \left(1 - k\int_0^1 y f_L(y)\,dy\right) b_{tL}$
		$b_{tL} \in R$
		$b_{nL} = k\left(\int_0^1 y f_L(y)\,dy\right) b_{tL}$
	Type-H	$w_H = c$
		$b_{tH} = 0$
		$b_{nH} = 0$
Case 2 L: Test H: Advanced treatment	Type-L	$w_L = \left(\left(\alpha h \int_0^{\hat{\tau}} y f_L(y)\,dy + k b_{tL} \int_{\hat{\tau}}^1 y f_L(y)\,dy + (c - b_{tL}) \int_{\hat{\tau}}^1 f_L(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s - \lambda_r) - z - c\right) + \left(\int_0^{\hat{\tau}} f_L(y)\,dy - \int_0^{\hat{\tau}} y f_L(y)\,dy\right)\left(h(c - z\alpha) + c(1-k)(\lambda_s - \lambda_r) + b_{tL}\left((z+c)k - (1+\alpha)h - (1-k)(\lambda_s - \lambda_r)\right)\right)\right) / \left(\left(1 - \int_0^{\hat{\tau}} y f_L(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\right) - (z+c)\int_{\hat{\tau}}^1 f_L(y)\,dy\right)$
		$b_{tL} \in R$
		$b_{nL} = \left((z+c)(\alpha h - k b_{tL}) \int_{\hat{\tau}}^1 f_L(y)\,dy + \left(\alpha h \int_0^{\hat{\tau}} y f_L(y)\,dy + k b_{tL} \int_{\hat{\tau}}^1 y f_L(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\right)\right) / \left(\left(1 - \int_0^{\hat{\tau}} y f_L(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s - \lambda_r)\right) - (z+c)\int_{\hat{\tau}}^1 f_L(y)\,dy\right)$
	Type-H	$w_H = c$
		$b_{tH} = 0$
		$b_{nH} = 0$
Case 3 L: Basic treatment H: Advanced treatment	Type-L	$w_L = c - h\alpha - (1-k) b_{tL}$
		$b_{tL} \in R$
		$b_{nL} = \alpha h \frac{\int_0^1 y f_L(y)\,dy}{1 - \int_0^1 y f_L(y)\,dy}$
	Type-H	$w_H = c$
		$b_{tH} = 0$
		$b_{nH} = 0$

Case 4 L: Basic treatment H: Test	Type-L	$w_L = c - b_{tL} + b_{nL}$
		$b_{tL} \in R$
		$b_{nL} = \alpha h\left((c+z)\int_{\hat{\tau}}^{1} f_L(y)\,dy - (c+z)\left(\int_{\hat{\tau}}^{1} f_H(y)\,dy\right)\left(1-\int_0^1 y f_L(y)\,dy\right) - \left(\left(\int_0^{\hat{\tau}} y f_H(y)\,dy\right)\left(1-\int_0^1 y f_L(y)\,dy\right) + \int_{\hat{\tau}}^{1} y f_L(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r)\right)\right) / \left(1-\int_0^1 y f_L(y)\,dy\right)\left((c+z)\int_{\hat{\tau}}^{1} f_H(y)\,dy - \left(1-\int_0^{\hat{\tau}} y f_H(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r)\right)\right)$
	Type-H	$w_H = \left(\left(\alpha h\int_0^{\hat{\tau}} y f_H(y)\,dy + c\int_{\hat{\tau}}^{1} f_H(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r) - z - c\right) + \left(\int_0^{\hat{\tau}} f_H(y)\,dy - \int_0^{\hat{\tau}} y f_H(y)\,dy\right)\left(h(c-z\alpha) + c(1-k)(\lambda_s-\lambda_r)\right)\right) / \left(\left(1-\int_0^{\hat{\tau}} y f_H(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r)\right) - (z+c)\int_{\hat{\tau}}^{1} f_H(y)\,dy\right)$
		$b_{tH} = 0$
		$b_{nH} = \alpha h\left((z+c)\int_{\hat{\tau}}^{1} f_H(y)\,dy + \left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r)\right)\int_0^{\hat{\tau}} y f_H(y)\,dy\right) / \left(\left(1-\int_0^{\hat{\tau}} y f_H(y)\,dy\right)\left((1+\alpha)h + (1-k)(\lambda_s-\lambda_r)\right) - (z+c)\int_{\hat{\tau}}^{1} f_H(y)\,dy\right)$
Case 5 L: Basic treatment H: Basic treatment	Type-L	$w_L = c - h\alpha - (1-k)b_{tL}$
		$b_{tL} \in R$
		$b_{nL} = \alpha h\dfrac{\int_0^1 y f_H(y)\,dy}{1-\int_0^1 y f_H(y)\,dy}$
	Type-H	$w_H = c - h\alpha$
		$b_{tH} \in R$
		$b_{nH} = \alpha h\dfrac{\int_0^1 y f_H(y)\,dy}{1-\int_0^1 y f_H(y)\,dy}$

Table A3: Optimal treatment choices, payment schemes and distance of social welfare under different payment models

	Full Information $\zeta_i = \{w_i,\ b_{ti}, b_{ni}\}$			Proposed Model $\zeta_i = \{w_i,\ b_{ti}, b_{ni}\}$				$\zeta_i'' = \{w_i,\ b_i\}$				$\zeta' = \{w, b\}$		
τ	Case	$\{w_L, b_{nL}\}$	$\{w_H, b_{nH}\}$	Case	$\{w_L, b_{nL}\}$	$\{w_H, b_{nH}\}$	% of Full Information	Case	$\{w_L, b_L\}$	$\{w_H, b_H\}$	% of Full Information	Case	$\{w, b\}$	% of Full Information
0.997	5	{23235, 3075}	{23235, 12300}	5	{23235, 12300}	{23235, 12300}	94.74%	5	{23235, 12300}	{23235, 12300}	94.74%	5	{23235, 12300}	94.74%
0.824	5	{22500, 3750}	{22500, 15000}	4	{23238, 13238}	{26150,13182}	93.58%	4	{21785, 14300}	{23236, 14278}	92.89%	5	{21750, 15000}	92.68%
0.690	4	{21000, 4500}	{27649, 12458}	4	{22777, 13777}	{27649, 12458}	94.20%	3	{20775, 4500}	{30000, 0}	93.92%	6	{23255, 15476}	90.84%
0.521	6	{26169, 5064}	{28923, 10816}	2	{26169, 5064}	{30000, 0}	97.15%	2	{23606, 5327}	{30000, 0}	97.15%	6	{23312, 16587}	91.20%
0.419	6	{26908, 5489}	{29394, 9765}	2	{26908, 5489}	{30000, 0}	98.93%	2	{23592, 5998}	{30000, 0}	98.93%	6	{23361, 17048}	90.81%
0.281	2	{27966, 5957}	{30000, 0}	2	{27966, 5957}	{30000, 0}	100.00%	2	{23584, 7000}	{30000, 0}	100.00%	6	{23437, 17428}	89.62%
0.211	2	{28502, 6133}	{30000, 0}	2	{28502, 6133}	{30000, 0}	100.00%	2	{23584, 7546}	{30000, 0}	100.00%	1	{30000, 0}	89.36%
0.085	2	{29430, 6337}	{30000, 0}	2	{29430, 6337}	{30000, 0}	100.00%	2	{23594, 8601}	{30000, 0}	100.00%	1	{30000, 0}	96.91%