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メタデータ	言語: eng 出版者: 公開日: 2011-06-13 キーワード (Ja): キーワード (En): 作成者: Watanabe, Shigeru, Koh, Genju, Kuboda, Kazuo メールアドレス: 所属:
URL	https://doi.org/10.24729/00000860

A Note on Medical Malpractice Insurance, Hospital and Doctor

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Abstract:

A purpose of this note is to analyze the relationship between the medical malpractice insurance of hospital and that of doctors who work at that hospital. In this note two cases are examined.

In the first case the budget of the hospital is allocated between the wage of the doctor and the insurance premium for the accident in the hospital. In the second case the budget is allocated among the wage of doctor, the insurance premium for the accident in the hospital and the preventive expenditures for decreasing both the possibility of the accident and the amount of the damage in the case of accident.

Following main results have been derived in the first case, the utility of the representative doctor does not depend on the rate of the allocation between the wage and the insurance premium. On the other hand, in the second case the utility depends on the rate of the allocation. The utility of the representative doctor is maximized if the budget is allocated such that the sum of the elasticity of the accident possibility with respect to the preventive expenditures and that of the accidental damage amount with respect to that expenditures is equal to the rate between that expenditures and the expected value of the damage amount. [*Journal of Economics, Business and Law*, Published in December 31, 2010]

Key Words; Medical Malpractice Insurance, Hospital, Doctors

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1 Introduction

A purpose of this note is to analyze the medical care¹ examining the relationship between the medical malpractice² insurance paid by the hospital and that paid by the doctors who work at that hospital. In this note the following two cases are examined.

In the first case the budget of the hospital is allocated between the wage of the doctor and the insurance premium for the accident in the hospital. In the second case the budget is allocated among the wage of doctor, the insurance premium for the accident in the hospital and the preventive expenditures³ for decreasing both the possibility of the accident and the amount of the damage in the case of accident.

Following main results have been derived in the first case, the utility of the representative doctor does not depend on the rate of the allocation between the wage and the insurance premium. On the other hand, in the second case the utility depends on the rate of the allocation. The utility of the representative doctor is maximized if the budget is allocated such that the sum of the elasticity of the accident possibility with respect to the preventive expenditures and that of the accidental damage amount with respect to that expenditures is equal to the rate between that expenditures and the expected value of the damage amount.

In the next section a simple model will be presented. And in the last section concluding remarks will be given.

2 A Simple Model

In the first case the budget is allocated between the wage of the representative doctor and the insurance premium paid by the hospital for the accident by the doctor. The insurance of the hospital may include not only the accidental damage due to the medical malpractice of the doctor but also that due to the mistake of the hospital. However, only the former accidental damage is considered in this note.

Expected utility of the representative doctor is denoted by (1).

$$\begin{aligned}
 EU &= (1-q) \alpha \log \{(1-\theta)B - \hat{r}\} \\
 &+ q \alpha \log \{(1-\theta)B - \hat{r} - L + \lambda \theta B + \hat{\lambda} \hat{r}\},
 \end{aligned}
 \tag{1}$$

where q is the probability of accident, $\alpha \log \{ \cdot \}$, $\alpha > 0$, is the specified utility function, $1 - \theta$ is the rate of budget for wage, B is the given budget of the hospital, \hat{r} is the insurance premium paid by the doctor, L is the amount of accidental damage, $\lambda \theta B$ is the insurance payment from the insurance paid by the hospital, where λ is the payment rate $\hat{\lambda}$ is the payment rate from the insurance paid by the doctor.

Maximizing the expected utility with respect to the insurance premium paid by the doctor yields the following first order conditions.

$$\begin{aligned}
 \frac{dEU}{d\hat{r}} &= (1-q) \alpha \frac{-1}{(1-\theta)B - \hat{r}} \\
 &+ q \alpha \frac{-1 + \hat{\lambda}}{(1-\theta)B - \hat{r} - L + \lambda \theta B + \hat{\lambda} \hat{r}} \\
 &= 0.
 \end{aligned}
 \tag{2}$$

Second order condition is satisfied.

$$\begin{aligned}
 \frac{d^2EU}{d\hat{r}^2} &= - (1-q) \alpha \{(1-\theta)B - \hat{r}\}^{-2} \\
 &- q \alpha (-1 + \hat{\lambda})^2 \{(1-\theta)B - \hat{r} - L + \lambda \theta B + \hat{\lambda} \hat{r}\}^{-2} \\
 &< 0.
 \end{aligned}
 \tag{3}$$

The optimal value of the insurance premium is obtained from the first order conditions.

$$\hat{r}^* = \frac{-(1-\theta)B(1-q\hat{\lambda}) - (1-q)(\lambda\theta B - L)}{\hat{\lambda} - 1}.
 \tag{4}$$

Under the fair insurance \hat{r}^* is reduced to

$$\hat{r}^* = qL - \theta B.
 \tag{5}$$

Hence, the following relations can be obtained straightforwardly.

$$\frac{\partial \hat{r}^*}{\partial q} > 0, \quad (6)$$

$$\frac{\partial \hat{r}^*}{\partial L} > 0, \quad (7)$$

$$\frac{\partial \hat{r}^*}{\partial \theta} < 0, \quad (8)$$

$$\frac{\partial \hat{r}^*}{\partial B} < 0. \quad (9)$$

Therefore, if the possibility of the accidental damage gets higher the insurance premium paid by the doctor will increase. Hence, if the possibility of the lawsuit against the doctor is different from region to region, the doctor in the high possibility region will pay more insurance premium.

Substituting the optimal value of the insurance premium into the expected utility of the doctor yields the following equation.

$$EU = \alpha \log(B - qL). \quad (10)$$

Hence, in this case the expected utility of the doctor does not depend on the rate of the allocation between the wage and insurance premium paid by the hospital.

Next, the second case where the budget is allocated among the wage of doctor, the insurance premium paid by the hospital and the preventive expenditures by the hospital in order to decrease both the possibility of the accident and the amount of the damage in the case of accident.

In this case the expected utility is denoted by the following equation.

$$EU = (1 - q(\theta_2 B)) \alpha \log\{(1 - \theta_1 - \theta_2)B - \hat{r}\} \\ + q(\theta_2 B) \alpha \log\{(1 - \theta_1 - \theta_2)B - \hat{r} - L + \lambda \theta_1 B + \hat{\lambda} \hat{r}\}, \quad (11)$$

where θ_2 is the rate for preventive expenditures from the budget, θ_1 is the rate for insurance premium paid by the hospital, $1 - \theta_1 - \theta_2$ is the rate for wage of doctor.

In the same way, the optimal value of the insurance premium paid by the

doctor is obtained.

$$\hat{r}^* = q (\theta_2 B) L (\theta_2 B) - \theta_1 B. \tag{12}$$

In the same way, the expected profit is shown by the following equation.

$$EU = \alpha \log \{ (1 - \theta_2) B - q (\theta_2 B) L (\theta_2 B) \}. \tag{13}$$

Maximizing the above expected utility with respect to the rate of allocation to the preventive expenditures yields the following condition.

$$\eta_s^q + \eta_s^L = \frac{S}{E[L]}, \quad (s \equiv \theta_2 B), \tag{14}$$

where $\eta_s^q \equiv \left| \frac{s}{q} \frac{dq}{ds} \right|$, $\eta_s^L \equiv \left| \frac{s}{L} \frac{dL}{ds} \right|$ and $E[L]$ is the expected value of L .

Hence, the utility of the representative doctor is maximized if the budget is allocated such that the sum of the elasticity of the accident possibility with respect to the preventive expenditures and that of the accidental damage amount with respect to that expenditures is equal to the rate between the expenditures and expected value of the amount of the damage.

3 Concluding Remarks

A purpose of this note is to analyze the relationship between the medical malpractice insurance of hospital and that of doctors who work at that hospital. In this note the following two cases are examined.

In the first case the budget of the hospital is allocated between the wage of the doctor and the insurance premium for the accident in the hospital. In the second case the budget is allocated among the wage of doctor, the insurance premium for the accident in the hospital and the preventive expenditures for decreasing both the possibility of the accident and the amount of the damage in the case of accident.

Following main results have been derived in the first case, the utility of the representative doctor does not depend on the rate of the allocation between the wage and the insurance premium. On the other hand, in the second case the utility depends on the rate of the allocation. The utility of the representative doctor is maximized if the budget is allocated such that the

sum of the elasticity of the accident possibility with respect to the preventive expenditures and that of the accidental damage amount with respect to that expenditures is equal to the rate between that expenditures and the expected value of the amount of the damage.

1 See Arrow (1963), Watanabe (1982).

2 See Michelle M Mello, David M Studdert, Troyen A Brennan (2003).

3 See Ehrlich and Becker (1972).

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